ENGINEERING AND MINING JOURNAL

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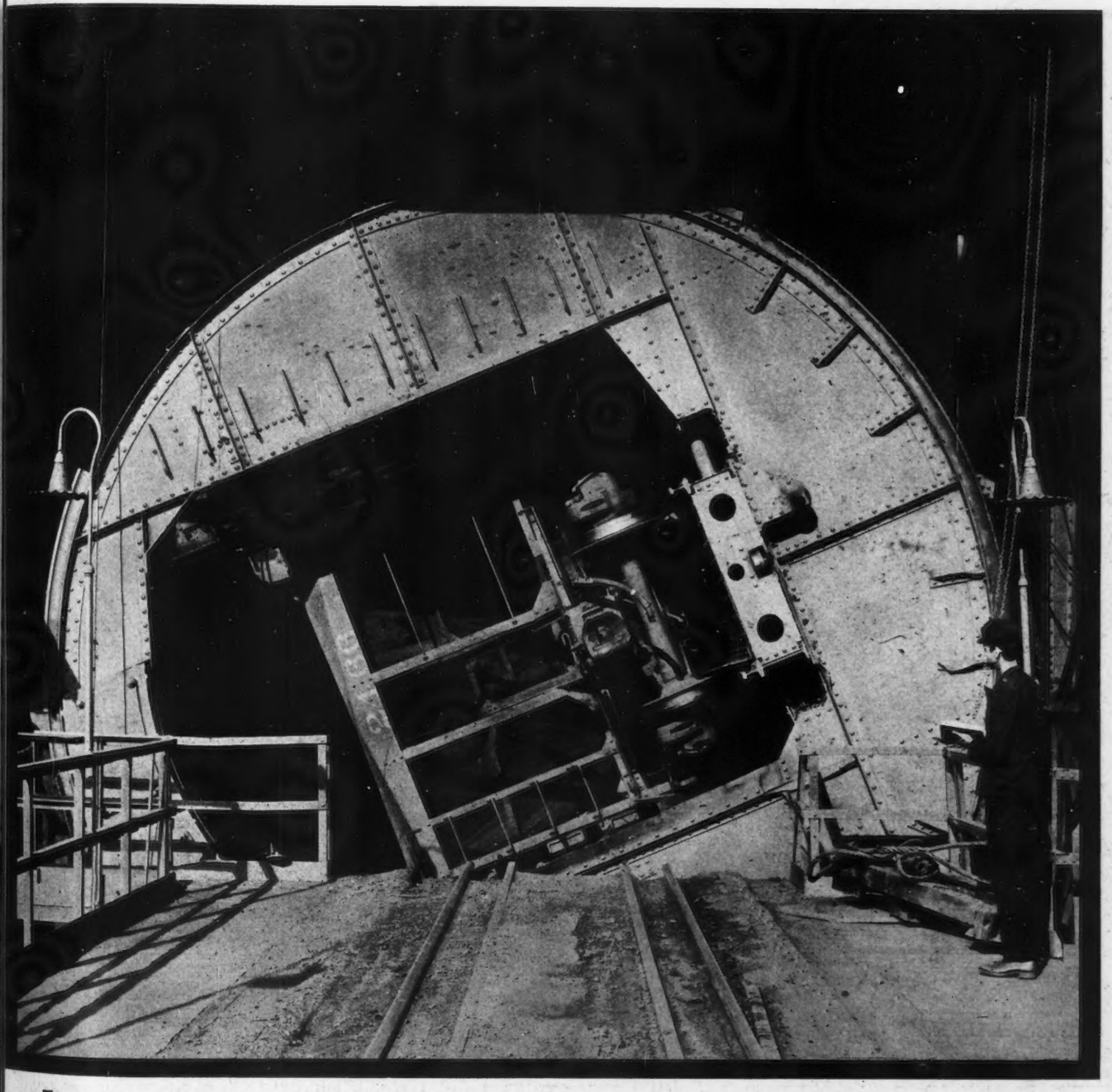
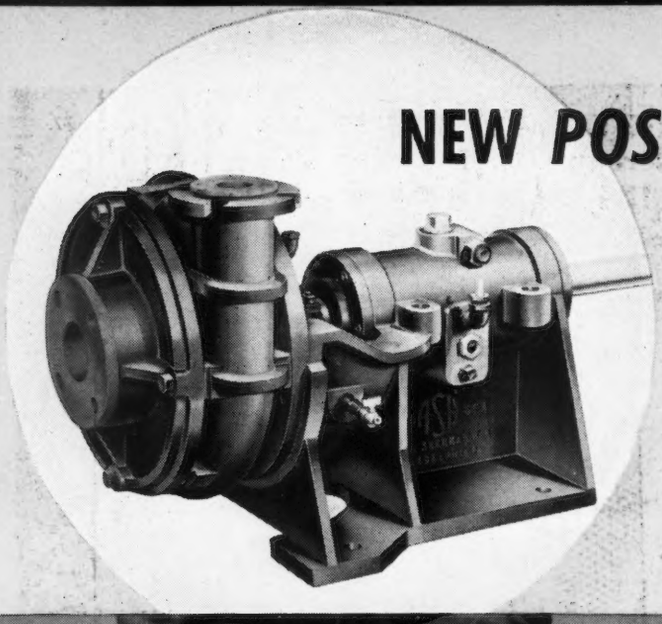


Emptying two 70-ton cars of ore at Tennessee Coal, Iron & Railroad Co.'s conditioning plant—Page 74

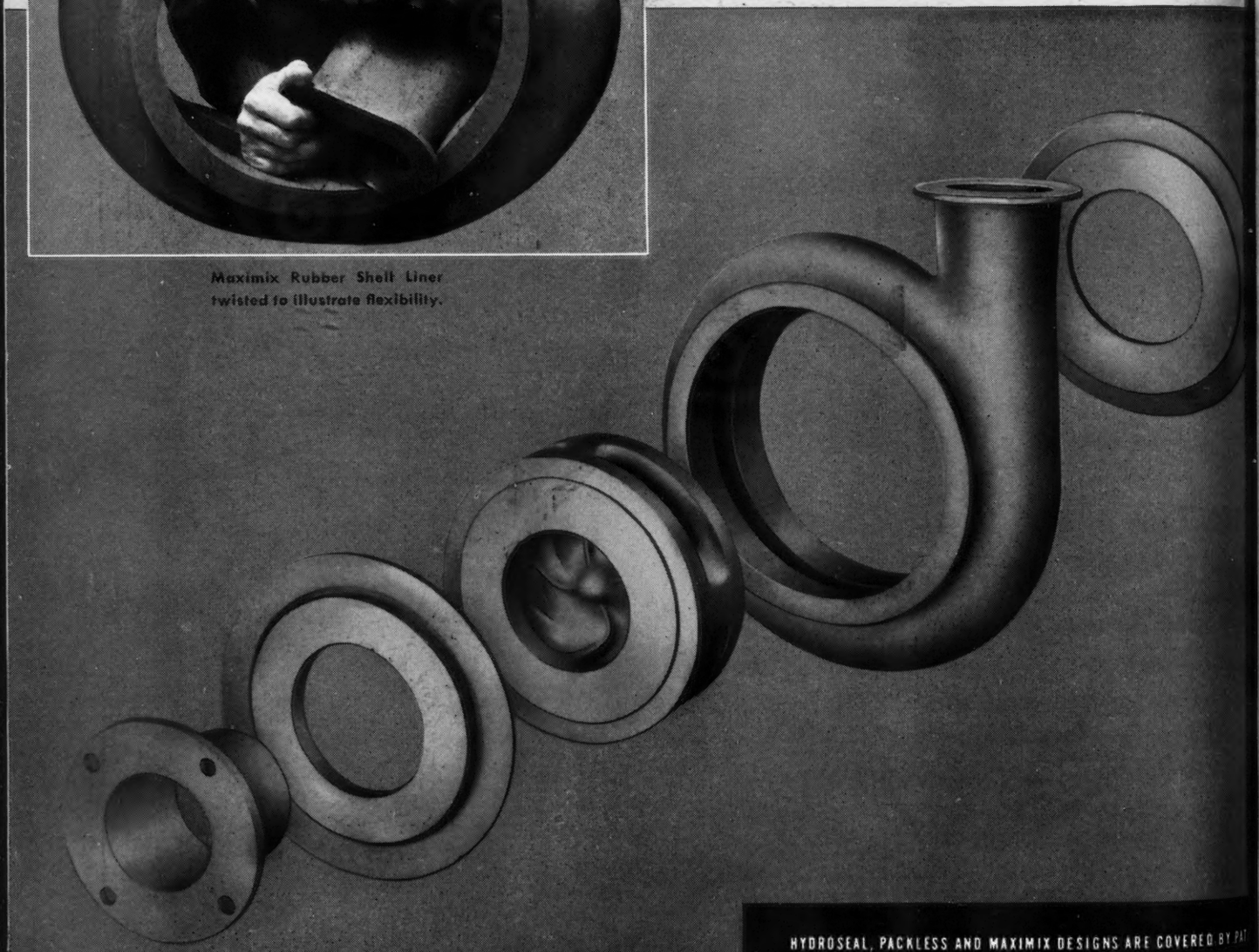
The Unsolved Rock-Burst Problem—Page 80

NEW *POST-WAR* HYDROSEAL PUMP



It looks exactly like its predecessor, doesn't it? Fundamentally it is. High efficiency, Hydrosealing, low maintenance, long life are still characteristics. However, new improved bearings, both radial and thrust, new adjustment of shaft and bearing assembly, new mounting and other new improvements and refinements are built into this post-war Hydroseal Pump. You would not be satisfied, nor would we, unless we gave all of this information to you in detail first-hand. Remind us to tell you also about the new Hydroseal Slurry Pump with its new seal which makes dilution infinitesimal.

Maximix Rubber Shell Liner twisted to illustrate flexibility.



Exploded photographs of Maximix Rubber Parts for Slurry Pump, showing, left to right, Suction Sleeve, Suction Bell Liner, Impeller, Shell Liner and Engine Bell Liner.

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PAT
AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE W

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ENGINEERING AND MINING JOURNAL

APRIL, 1947

Investigate the Federal Trade Commission

THE PRESTIGE of the Government is certainly not enhanced by the recent vicious attack of the Federal Trade Commission on large copper producers (p. 106). As in previous attacks of a similar nature, the Government stoops to slanderous inferences and insinuations designed to make front-page copy for newspapers, and so handled as to leave the public with the impression that the victims are rascals, no matter what the less lurid truth eventually proves to be.

The clear import of the FTC charge is that the copper industry is dominated by a few sinister individuals who slyly pull wires to sabotage the best interests of the commonwealth in their greed for unconscionable profits. These men are even inferred to have stalled labor negotiations during last year's strikes to bring about a shortage of copper and an economic crisis.

To those who know the men thus accused and their diligence in serving their companies and the public effectively, this attack is utterly shameful. Knowing the efforts that have been made to maintain maximum production during and since the war, frequently despite harassment from Government leftwingers, the absurdity of the charges makes us believe that the FTC, like the Interior Department, harbors a clique of radicals whose real purpose is to destroy public confidence in private enterprise.

Nothing could be more conducive to "panic buying" than the FTC report itself. Those in the trade know that the principal other contributors toward a runaway market in copper have been the buyers themselves, and that requirements are likely to slacken when industry's capacious "pipe lines" are filled. As for wartime fears of excess inventories, they were thoroughly justified by the industry's experience after the previous war, when a flood of scrap and world-wide deflation forced the industry into a year's shutdown.

Concerning the elaborate attempt to prove that copper industry leaders cannot be trusted because of participation in cartels years ago, we assert that during the thirties, international cooperation among foreign producers was perfectly legal and was the only thing that saved the copper industry from wrecking itself through ruinous competition. Had the industry invited the competition which the FTC now sponsors, the domestic industry would have been in no condition to make its remarkable contribution to the war effort. Incidentally, the Government itself stepped in to prevent the oil and coal industries from wrecking themselves by overcompetition.

We hope that the copper people thus slandered will demand full proof of the nasty charges made against them, just as Dow did when falsely smeared by the Truman committee. They ought to demand an investigation of the FTC, in order to expose how and why a Government agency indulges in such vicious tactics. We are sure that such an investigation would plow up some of Joe Stalin's fellow-travelers and might teach Government agencies to stick closer to facts.

Miners Discontented With Communist Control

WE ARE GLAD to observe (*E. & M. J.*, March, p. 88, and in this issue, p. 110) that the rank and file of the Mine, Mill and Smelter Workers, CIO, have awakened to the fact that Communists in the labor movement are simply using American labor as a catspaw in the accomplishment of their real objective. This is the destruction of democratic institutions and the ascendancy of the totalitarian clique which rules Russia with machine guns and a puppet press.

Despite an organizational set-up which gives the union officials control of the union newspaper and the power to hamstring opposition long after a mere majority of the rank and file would prefer a change, a substantial minority has at last revolted against being led around by the nose at the behest of Moscow. Up to the present the revolt is principally among brass-mill and smelter workers east of the Mississippi. However, knowing that the great majority of the members of this union in the West are loyal Americans, we predict that the revolt will expand until Comrade Stalin's

stooges are thrown out of the drivers' seats.

From the workman's standpoint, intramural warfare within the labor movement is deplorable, particularly at a time when the excesses of union radicals and the partiality of politicians have made the public incline toward curbing the prerogatives of labor unions. However, if the result is to shift actual control to the members instead of the leaders, and to develop leaders who are loyal to American labor instead of to the Russian dictatorship, gains to labor will outweigh the losses.

We have observed the actions of the M.M.S.W. leadership for several years and cannot recall any instance when it deviated from the Communist party line. This subservience to Moscow included the sharp swing from obstructionism to cooperation with our national policies when the Nazis attacked their Russian allies. Also, the strong-arm tactics and ballot-box stuffing of which the insurgents accuse the union leadership are strictly in the Communist tradition. Moreover, it has been evident to anyone who has read the union newspaper that its editors do their utmost to breed class hatred, and distrust of employers.

For several months we have believed that the American people would soon awaken to the fact that Communists are not sincere advocates of proletarianism but are simply servants of the Soviet dictatorship. We have anticipated that their sinister influence would be purged from the labor movement and Government. The furor in the M.M.S.W. and the Congressional deliberations over outlawing Communism indicate that these anticipations are being fulfilled very rapidly.

Confidence in Gold Returning

ADDRESSING the 75th Anniversary Jubilee of the A.I.M.E. on "The Future of Gold in the World Economy," P. M. Anderson, managing director of Union Corporation, Johannesburg, saw no basis for fear over gold's future status. He viewed gold as having a function in monetary systems similar to that of standby capacity in a power plant, and predicted that democratic nations will return to gold as rapidly as they can solve the emergency problems which have grown out of the war. Presuming that the Far East will improve its economic status, he saw it as a market for nearly half the gold production of the future. He predicted that the financially stronger democratic countries would soon make gold available to citizens, and that the financially weaker ones would find gold a necessary medium of exchange because of lack of confidence in their paper.

"The prime necessity will be for reserve stocks of international legal tender. In many countries these gold stocks may be held separately, as were the exchange equalization stocks in Britain in the 1930's, and their fluctuations may not be readily disclosed. They may not even form part of the backing of the reserve bank money nor be encumbered with any limit expressed as a percentage of the note issues. The second necessity is that gold may be acquired by the public or held in sufficient quantities by the monetary authorities for sale to the public if the latter should desire it. Gold will once more be available to the public, without obligation on the monetary authorities to sell it at the present price in all circumstances. However, those countries in the western world which may be described as the front-line or devastated areas of Europe will be very slow in giving their people access to gold.

"The extraordinary movements of gold, which resulted in the United States now having two-thirds of all the monetary gold in the world, will not be repeated. These movements were due to non-economic capital movements, which in future will be better controlled in most countries.

"At the present price of the metal, gold will be produced in quantities sufficient for a steady expansion, but not in any great abundance. Gold will presumably be added to the world's stock at a rate closer to 2% than to 3% per annum.

"The outlook for gold does not depend on particular forms of monetary policy, for instance on a return to a gold standard. It depends, however, on the recognition of the economic freedom and independence of the individual. Orators have sometimes spoken of 'nailing nations to a golden cross.' But in fact the integration of gold into monetary systems makes the individual less dependent on the vagaries of his own Government, and nations less dependent on those of foreign governments and institutions. I am confident of the future of gold in world economy, because I am hopeful that a large measure of economic freedom will be restored throughout the western world in due course."

It is interesting to note that the faith of gold producers in continued prestige for gold is being sustained by events in the news of the day. The Economists National Committee on Monetary Policy has recently come out for a return to a modified gold standard. Because this committee is not identified with any producer interest, in our opinion its action is an early manifestation of a situation we have long anticipated.

As we see it, the pressures will come from abroad because of the acute financial distress of many foreign nations, and the United States will follow along in an attempt to keep peace in the family of nations. The economists' committee move indicates a realization of how chaotic foreign conditions are, and how impotent a country is to help itself once it embraces "funny money."

Tungsten Carbide Opens a New Era in Drilling

CHANGES in both percussion and rotary drilling that promise to be revolutionary are under way. The long-continued evolution of drilling practice has stepped up to a revolutionary pace as certain groups in the mining industry have become aware of the truly marvelous rock-penetrating ability of drills tipped with tungsten carbide.

The performance of this substance on metal as a rival of high-speed tool steel in the shop has been impressive for some years. Adoption of it for this purpose was not rapid, however, at the start because of the relatively high cost of tungsten-carbide tools, and also because machine tools in general were not designed for the deeper cuts that carbide-tipped tools could make. Shopmen, moreover, did not know how to sharpen it. All that is changed. Tungsten carbide played a noble part in helping achieve the high wartime-production records. Today, we also understand, machine tools are being built to take full advantage of the cutting power of tungsten carbide and shops for dressing such tools properly are being established. Competent opinion holds that tungsten-carbide may eventually displace high-speed tool steel.

Applied to the newer task of cutting rock in drill holes, experimental tests with it suggest a similar course of triumphal progress in mining work. The new development comes at a time when it will do much good in offsetting the sharp increase in labor costs. Without some such means of cutting costs, many a deposit is likely to lie unworked. *E.&M.J.* proposes to keep its readers posted on the progress made in drilling with tungsten carbide. Three articles dealing with it, in the February, March, and current April issues, respectively, have already appeared, and it is intended that others will follow from time to time.

Meanwhile, the industry will be trying the new cutting tools provided and no doubt improving its practice so that other operations may keep pace with drilling. Those companies especially that have ore that is extraordinarily hard to drill have it in their power to conduct tests that may prove not only highly interesting but profitable.

Industry Has a Stake in Education

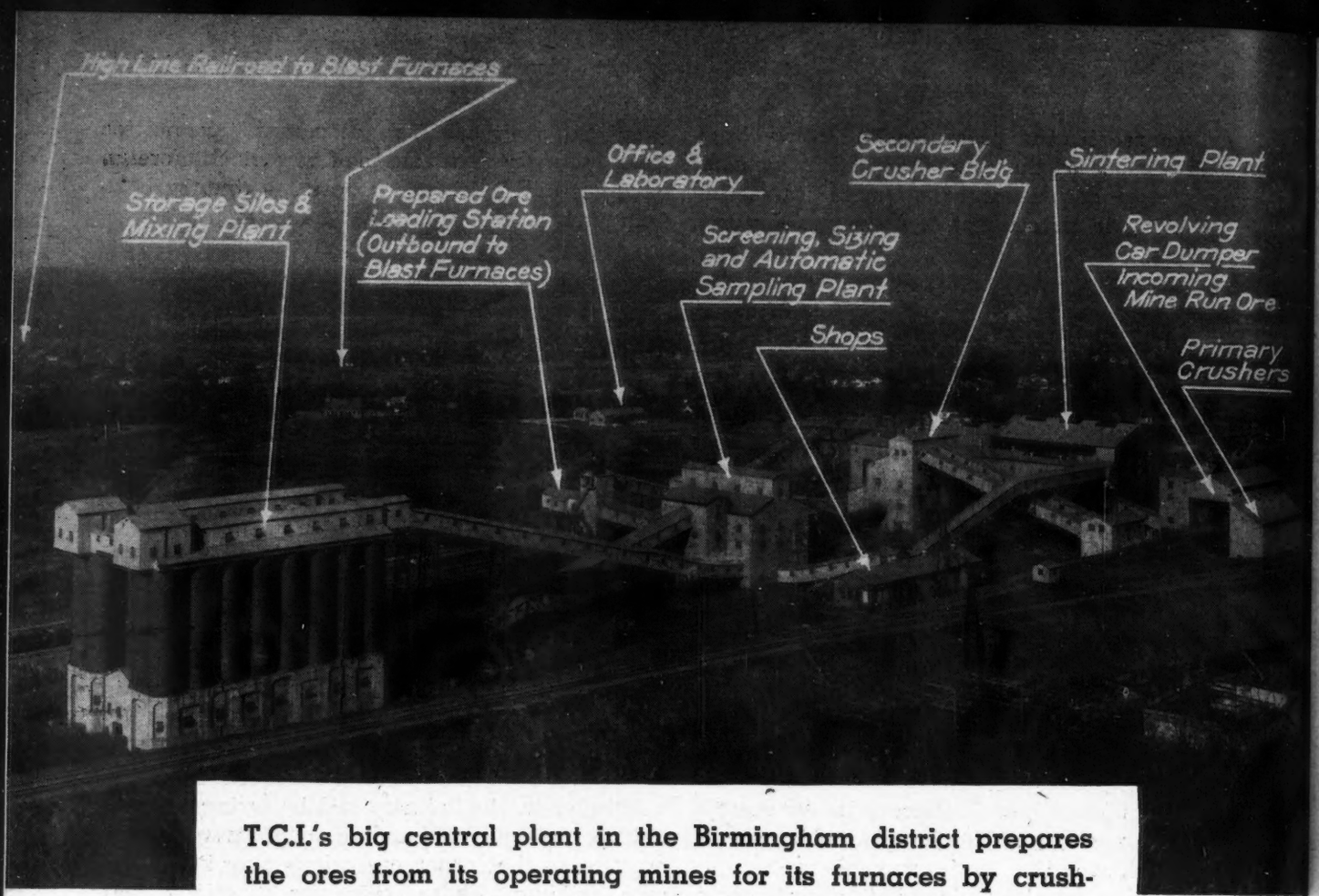
TO RUFFLE COMPLACENCY over the status of mining education is the aim of this editorial. The fact that most mining schools, like all others, have been crowded to capacity seems to have afforded a certain assurance over the future supply of mining technical men. Such assurance is not warranted until it has been shown that most of the students taking mining instruction really intend to enter the industry. Under present conditions it may be that a considerable portion are enrolled in mining curricula because of overcrowding in courses they would prefer.

Also, such checks as we have been able to make suggest that mining curricula are not getting a satisfactory share of the most enterprising and apt students. Such a result is not surprising in view of the positive efforts to attract outstanding students that some other industries are making. They are visiting schools to establish contacts and are offering post-graduate training courses and attractive starting salaries, in contrast with the apathy shown by most mining companies.

We should like to point out that it is not enough to appraise mining education in the light of present needs. The growing needs for minerals, the increasing difficulty of discovery, and the convergence on low-grade deposits, all indicate that the mining industry's future needs for technical men, particularly outstanding ones, and for research will be much greater than at present.

Recognizing the need for faculties that offer inspiration as well as facts, many mining school heads are worried over providing for payment of more attractive salaries. To them we suggest that many mining companies would probably recognize their stakes in the educational problem if they were made much better acquainted with its importance. After all, to those who are looking ahead, what could be more important than the caliber and training of the men who will give the industry most of its future guidance and technical progress?

We also believe that the good results being obtained with cooperative education, where the student spends a part of his curriculum in industry, warrant this kind of training in mining schools.



T.C.I.'s big central plant in the Birmingham district prepares the ores from its operating mines for its furnaces by crushing, screening, and blending. Three sintering machines handle the fines in what is the world's largest ferrous installation.

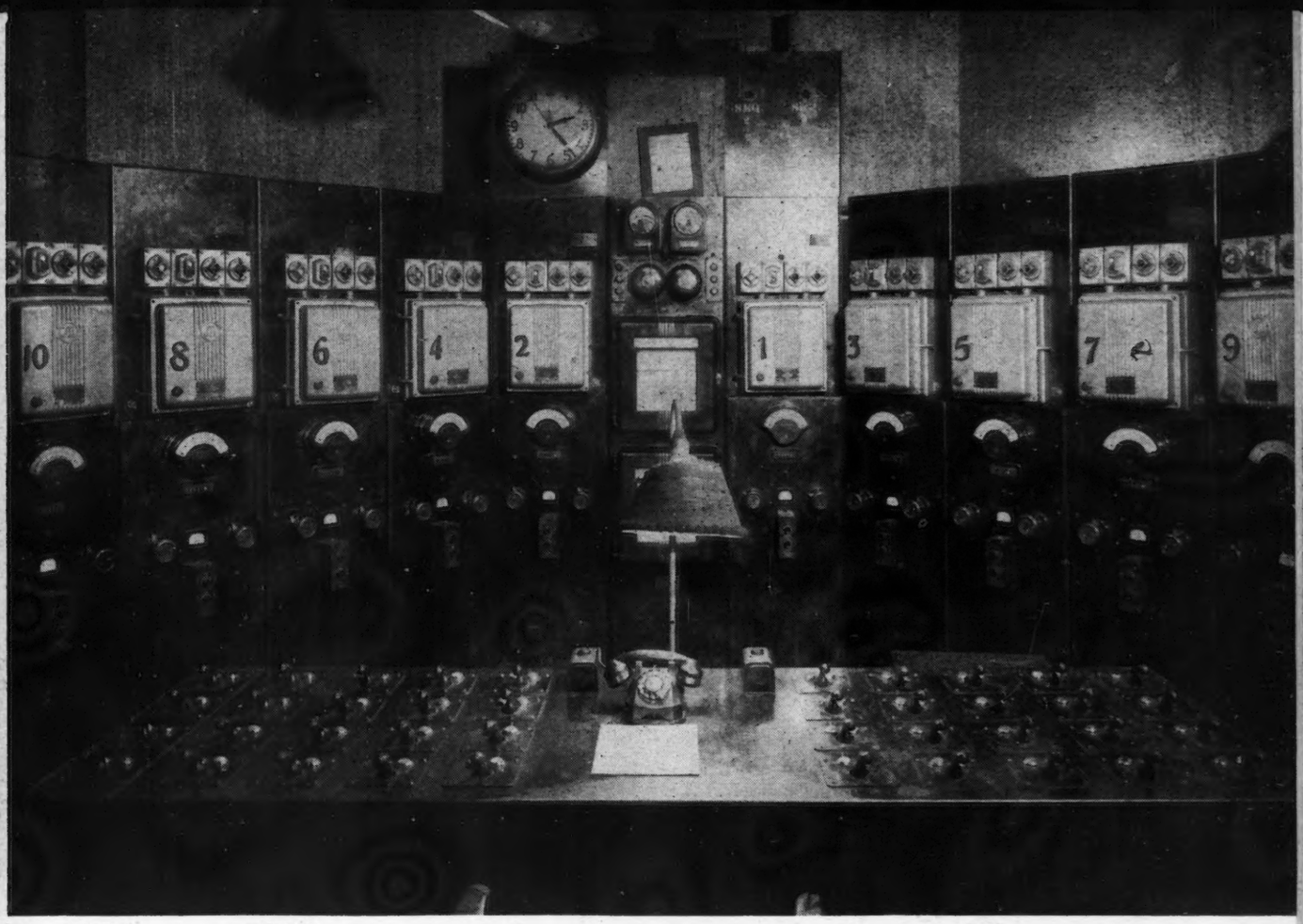
Remote Control a Feature of Ore-Conditioning Plant

A. A. NILSEN, Ore Beneficiation Engineer, and **ROY YINGLING,** Superintendent, Ore Conditioning and Sintering Plant, Tennessee Coal, Iron & Railroad Co., United States Steel Corporation Subsidiary, Birmingham, Ala.

TO IMPROVE blast-furnace practice at the Ensley and Fairfield plants of Tennessee Coal, Iron & Railroad Co., it was decided in 1939 to install an ore-conditioning plant at Wenonah in which raw ore from all the mines operated by the company on Red Mountain between Birmingham and Bessemer, Ala., could be treated. The plant was designed to crush, screen, and blend the raw ores, and sinter the fines resulting from the ore conditioning together with accumulated flue dust. Ore was first put through it in November 1940, and by January 1941 the entire production of red ore was being conditioned.

The original installation included only one sintering machine, so fines produced in excess of its capacity were blended to an approximately uniform chemical analysis and stocked until August 1941, when two additional machines and the necessary auxiliary equipment were put into operation. Since then the total production of fines has been sintered, together with much accumulated flue dust and stocked ore fines. Various other changes have been made during operations, including erection of additional silos for all sizes of ore.

Incoming raw ore is crushed so that approximately 75% will be minus 1-in. and, by screening, separated into three sizes: plus ¾-in.; minus ¾-in. plus ⅜-in.; and fine, which includes all material below ⅜-in. size. Each size is stored in bins by mines and is blended to a predetermined analysis. In that way, instead of having to work with seven or eight ores of different



CONTROL ROOM from which operations involved in filling and withdrawing ore from 40 800-ton storage silos for blending are directed. Each of the 10 numbered panels of proportional feeder controls serves four silos. Gates are controlled from levers in front.

analyses, ranging in size from dust to 3½ in., the furnaces will be supplied with two sizes of uniform blended ore—namely, coarse and medium, and sinter, which includes the blended fines and flue dust.

Raw ore is loaded directly into 70-ton cars at the tipples and brought to the plant, which is located so as to involve the minimum up-hill haul between mines and furnaces. Trackage is provided at the plant for ore and material to be mixed with fines for sintering. Ordinarily, all ore mined on one shift is passed through the plant the next shift, an interval of four hours between permitting "practice" men to make up blends from the last ores run through the plant before starting to draw from the silos.

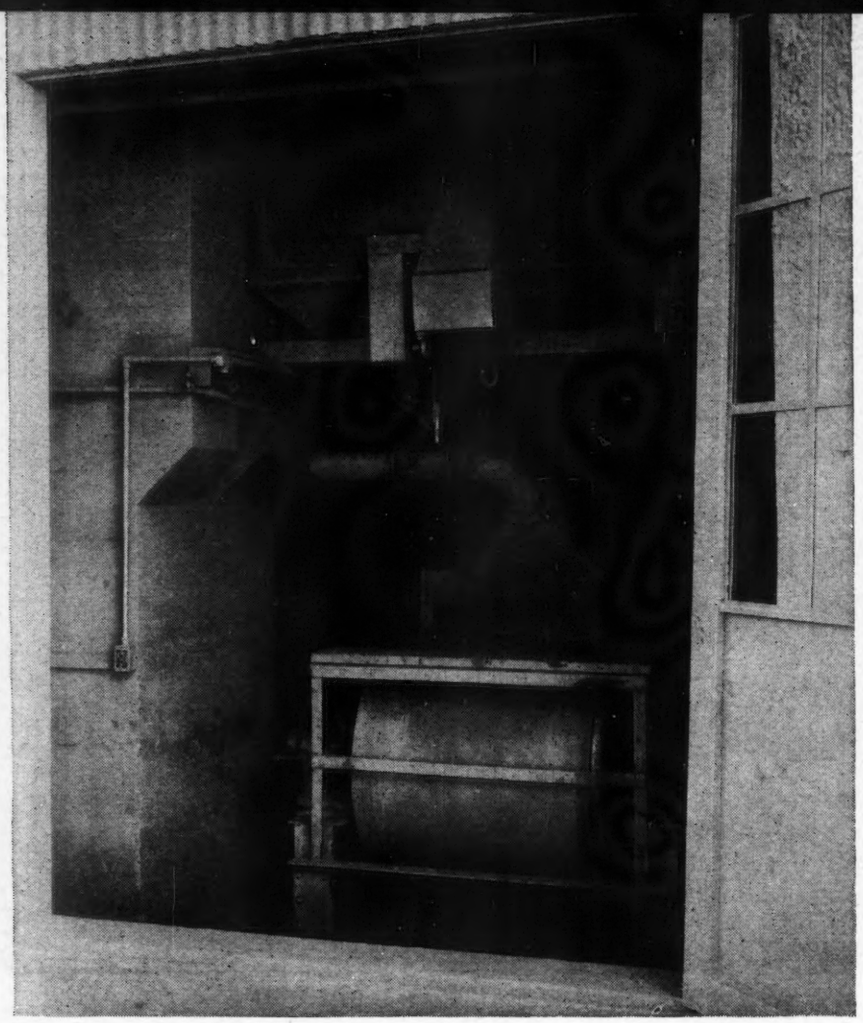
The practice man, with the cooperation of the raw-material foreman, makes out a schedule of the sequence for handling the ore from each mine through the plant. This being the guide, a switch engine picks up the cars from the specified mine, and brings them to the two-car rotary dump feeding the primary crushers. Electrical controls assure correct spotting on the dumper, which cannot operate until the cars are locked in place. The operator telephones ahead to the various stations that he is ready to unload ore. Each station, starting with the secondary crushing plant, telephones ahead to the succeeding point in the ore flow when his station is ready. When the silo control room receives the "all-clear" signal, the operator signals the rotary dump that everything is ready for handling ore from the specified mine.

Conditioning Begins

Two cars are dumped at a time, the ore feeding over a chute directly into two 42-in. gyratories set to 5-in. discharge and driven by 300-hp. 2,200-v. motors through V-belt drives. They each deliver to 36-in. conveyors, operating at 350 fpm. on 320-ft. centers and powered by 125-hp. motors, which raise the material to surge bins feeding four secondary crushers. A magnet over each belt near the head pulley removes loose tramp iron, and a magnetic head pulley catches the iron that escapes it.

From these bins the ore is fed at the desired rate by vibrating feeders into cone crushers, set for a maximum size of 1½ in. with 75% less than 1 in. A double-deck vibrating screen above one of the crushers removes plus-4-in. lumps to serve as open-hearth charge ore, ordinarily operating only on high-grade ore from the Wenonah mine. Material passing the crushers is collected on a 42-in. belt, weighed on a conveyor scale, and taken to the screening plant for separation into coarse, medium, and fine grades. Other conveyors take open-hearth charge ore from the screens to a bin for delivery to the furnaces.

Several innovations are to be found in the secondary crusher building. If a crusher chute should clog, or the conveyor slip on its head pulley, serious damage would follow unless precautions were taken. A series of "rat traps" catch potential trouble and prevent breakage. Should crushed ore start to pile up in a discharge chute, when it reaches the danger point it starts to spill out through a short 8x12-in. auxiliary chute into a basket trap. The door of this trap is weighed so as not to be tripped by an occasional piece of ore, but when enough ore



"RAT TRAP" on chute discharging ore from secondary crusher to belt for delivery to screening plant. Should the chute tend to choke, some of the ore spills over into the trap, eventually shutting crusher down.

has accumulated, it swings down, breaking the crusher-motor circuit and sounding an alarm. One of these traps is installed on the delivery chute of each of the four secondary crushers. The device was perfected by the plant's mechanical and electrical maintenance department crew.

Another auxiliary feature which has been of value in reducing maintenance and repair costs is the extension of the craneway in the secondary-crusher building over a concrete apron outside one end of the building. Trucks can drive up to take away parts for repair, or to deliver such parts directly to the crane for installation, or to leave them on the apron for storage.

A double lubrication system is provided for the crushers, either of the two ways being capable of maintaining complete lubrication. Lubricant feeds by gravity from an overhead tank down through the crusher system into a sump, from which it is pumped back through a cooling system to the tank again.

The operator of the secondary crushing plant is stationed on the upper floor where he can watch the level of ore in the four crusher bins. For convenience he has before him an indicator board which signals by means of white, green, and red lights the amount of ore being fed from the four bins by hundreds of tons per hour from 100 to 2,000. When 1,800 tons per hour is reached, a warning horn is sounded until the rate of feed has been reduced by the operator through electrical controls on the vibrating feeders.

Separating the Sizes

Six double-deck vibrating screens separate the crushed ore into the three sizes. Automatic equipment developed by the engineering department samples each size at a rate designed to provide an 0.5% sample continuously, and reduces the sample by crushers, rolls, and splitters to laboratory size. Such samples are taken to the laboratory after each mine run of incoming cars.

Two double sets of 30-in. conveyors deliver either coarse or medium ore to 36-in. conveyors, which, after passing weigh stations that record by remote control at the silo control room, raise the ore to the 800-ton silos or storage bins selected by the practice man. Forty silos are provided in two double banks, the west bank for storing coarse, and the east bank for medium ore. Each silo is approximately 18 ft. in diameter and 67 ft. high.

A series of 30-in. conveyors takes all fines over a scale, which also records at the silo control room, to a group of 23 350-ton bins adjoining the sintering plant.

When all the ore from a particular mine has been dumped and time allowed for the system to clear itself, the rotary-dump operator advises all stations as to the number of the next mine from which ore will be accepted. Preparations then begin in reverse order by setting the trippers over the ore bins designated by the practice man, each station reporting back until the silo-control room gets clearance in both directions. The operator then tells the rotary-dump operator to begin dumping again.

Making Up Blends

If all the mines have been operated during the previous shift, when dumping has been completed at the conditioning plant there will be various tonnages of ore in at least eight coarse-ore silos, eight medium-ore silos, and eight fines bins. To avoid complicating the blending, ore is dumped only into empty silos so that the practice man can make up his blends from definite quantities of ore which has been analyzed. One bin may be full, and another may hold only 50 or 100 tons in some cases, but the small tonnage will be used up before additional material is dumped into the bin, even though it may be known that more ore from the same mine will be delivered during the next shift.

Each bank of 20 silos has a separate proportional feeder for each four silos, so arranged that it can draw from only one silo at a time. Inasmuch as the ore from each mine differs in analysis, the blends must necessarily be made up from not more than one silo in a group, or more than five units at a time. Each of the fines bins has a separate feeding scale underneath, and material from them may be blended in any combination or weight. Data furnished the practice man indicates the degree of acidity of the ores, or, in some cases, their basicity. With

these facts, plus the tonnage figures, he is able to make up a blend to any desired degree of acidity. Most of the ores are on the acid side.

Actual assembly of the five different ores is done by the blending-plant operator. Under each silo is an air-operated gate which discharges into a hopper common to a group of four silos. Under the hopper is a vibrating feeder, electrically controlled from a 60-in. weigh belt, the scale of which is set so that 250 lb. of ore will be fed per linear foot of belt. By varying the belt speed, its discharge rate may be changed from 1 ton to 10 tons per minute, the loading per foot remaining constant. Thus five belts feed from the coarse-ore silos to the main blend belt, and a similar set-up is installed under the medium-ore silos, both sets of feeder belts discharging to their own 36-in. blending belts, which are centered between the two groups of silos. In the silo control room the silo-plant operator takes the practice man's sheets, opens the correct silo gates, starts the weigh belts, and sets the individual indicator dials to the prescribed feeding rate. At the end of the computed time the total blend has been assembled and he is ready for another.

The procedure is the same for both coarse and medium ores, and both banks of silos can be drawn on at the same time, inasmuch as the blending-conveyor belts discharge into separate 100-ton surge bins at the car-loading station. Check samples for chemical analysis are taken at the discharge end of these conveyors.

In the Silo Control Room

The bank of levers immediately in front of the operator in the center of the room controls the air cylinders which open and close the gates to the individual silos. Interlocking connections prevent opening more than one gate in any group of four silos.

On the wall facing the operator are two boards or banks of proportional feeder controls, one for the coarse-ore silos and one for the medium, there being a separate panel for each group of four. The white light to the left at the top of each panel is on only when the plant is "in sequence," and nothing can be done except when it is on. The two buttons beside it energize the panel and operating board. The green light indicates that the feeder belt is carrying less load than it should, and the red light indicates overloading. Both are connected with mechanisms which serve to adjust loading.

Below, midway on each panel, is the dial gage graduated in terms of tons per minute to show feeder rate, the knobs below this to the right and left serving to adjust the rate as desired. A counter directly under each gage keeps track of the tonnage as it leaves the silo.

If either the red or green light stays on for more than a minute, a gong rings to call attention to the need for adjustment more drastic than the automatic equipment can provide. Should this not be effected within another minute, the whole bank of silos is shut down so that the blend being assembled will not be thrown out of balance to any serious extent. A recorder chart is installed in the middle between the two banks of proportional feeder controls. A bank of indicator lights on the wall at the operator's right shows him at a glance the silos which are being filled, thus avoiding the possibility of drawing on one when it is being filled.

In the Sintering Plant

The iron-ore sintering plant, thought to be the largest in the world, adjoins the crushing plant and is equipped with three modern sintering machines and three rows of bins for stocking ore fines, flue dust, and coke breeze (which ordinarily is pit cleanings from coke-quenching). Flue dust and coke screenings arrive in drop-bottom

BRATTICE CLOTH is run out over the empty pallets from discharge end to point near ignition chamber, when restarting sintering machine after repairs, to preserve the draft, as described in text. As new sinter bed advances, the cloth is re-rolled on its reel.

Ore Conditioning Plant—Silo Blending Schedule

Date.....Practiceman.....

First Blend 4% Time.....

Group	Silo	Mine	Acid	Basic	Rate	Check
10	39	14	12.50		2.50	382
8	15	10	10.25		2.50	381
6	10	9	8.50		2.50	383
4	8	6		1.00	4.15	625
2	3	4		2.50	4.15	624

4.02% Calculated blend analysis
4.06% Actual weighted analysis

Turn.....

Second Blend 5% Time.....

Group	Silo	Mine	Acid	Basic	Rate	Check
9	35	14	13.00		3.10	262
7	31	10	10.50		3.10	264
5	25	7	4.50		3.10	263
3	24	6		1.00	3.00	253
1	18	4		2.50	3.00	251

4.99% Calculated blend analysis
5.01% Actual weighted analysis

SAMPLE-BLENDING SCHEDULE for two blends. The entire form provides for six blends. "Acid" and "Basic" refer to chemical analysis; "Rate" means tonnage per minute from any one bin; "Check" gives tonnage used.

cars and unload into a track hopper, which acts as a surge bin. From this, sliding gates deliver onto a 36-in. belt which discharges over a tripper into either of the two short rows (7 or 10) of bins. These bins are 15x15-ft. in section and hold nominally 250 tons of flue dust each, or 80 tons of coke breeze. Ordinarily only 10 bins are used, the 7 others being reserved for fines. Flue dust, which runs in carbon from 12 to 22%, is used almost interchangeably with pit cleanings. Ordinarily, coke breeze is reserved for use over the week-end.

Ore fines, which consist of all the minus-⅜-in. material from the screening plant, are brought to the sintering-plant bins on a series of 30-in. belts, passing over a conveyor scale, which records at the silo-control room so that the weight of the three fractions into which the raw ore is divided can be totaled. A tripper discharges the fines, by mine runs, into appropriate bins, as with the coarse and medium fractions. An automatic sampler at the head of the fines conveyor in the screening plant provides for a consistent 0.5% sample.

Preparing the Mix

This material is blended by the sintering-machine operators, under instructions from the practice man. Scale feeders under each fines bin draw the fines from fixed notches, using a vibrator to assure constant flow. These short belts, driven by two-speed motors through variable-speed drives, will handle 3 to 50 tons per hour. They discharge onto a conveyor, which also picks up the correct amount of flue dust or coke breeze en route to the hopper above the pugmill feeding the sintering machines. Sinter fines, passing a stationary 1¼-in. grizzly at the sinter-discharge chute, are added to the fine-ore and flue-dust blend on the belt, a plow spreading the cold ore and dust to provide a covering to protect the belt before the hot, returned fine sinter is added to the mix.

From the bin at the end of this conveyor the blended fines are fed into a drum-type pugmill for each sintering machine, moisture being added if necessary. It required much experimenting to develop a feeder for the three mills that would maintain a uniform proportion of carbon, ore, and returned-sinter fines. The present system, which works well, is known as a "revolving bread basket" and makes no attempt to split the feed but rather feeds all three machines in sequence, depending upon the mechanical blend on the belt being sufficiently uniform.

As the Red Mountain ores are highly refractory, little moisture is added in the pugmills. The pulverized mix feeds out continuously from each mill to its respective machine over a 24-in. belt to a swinging spout above the receiving hopper at the machine. The incoming mix strikes a wear plate first, slides off to a feeder plate, and then falls to the advancing hearth evenly and with a minimum of wear in the hopper. As the mix drops onto the hearth the coarse material lies on the grates and the fine material on top with a gradation between, thus assuring a more uniform mix and a better final product from the machine.

The first sintering machine, which went into operation Jan. 1, 1941, has an active hearth area 72 in. wide by 89 ft. 3 in. long and a rated capacity of 50 net tons per hour. The two other machines, which were started Aug. 15, 1941, are 72 in. wide by 102 ft. long and are rated at 60 tons per hour. Low-pressure natural-gas furnaces, designed by the Tennessee Coal, Iron & Railroad Co.'s engineering department and the furnace builder, are used for ignition. Combustion air is furnished by three 144,000-cfm. fans at 24-in. static water pressure. Each fan is driven by a 1,000-hp. synchronous motor. The hearths are driven by 15-hp. motors and have a speed range of 4 to 12 fpm. under panel-board control. The sinter-machine panel boards include 33 sets of controls to give the operator complete control over his blend, hearth speed, air, and gas.

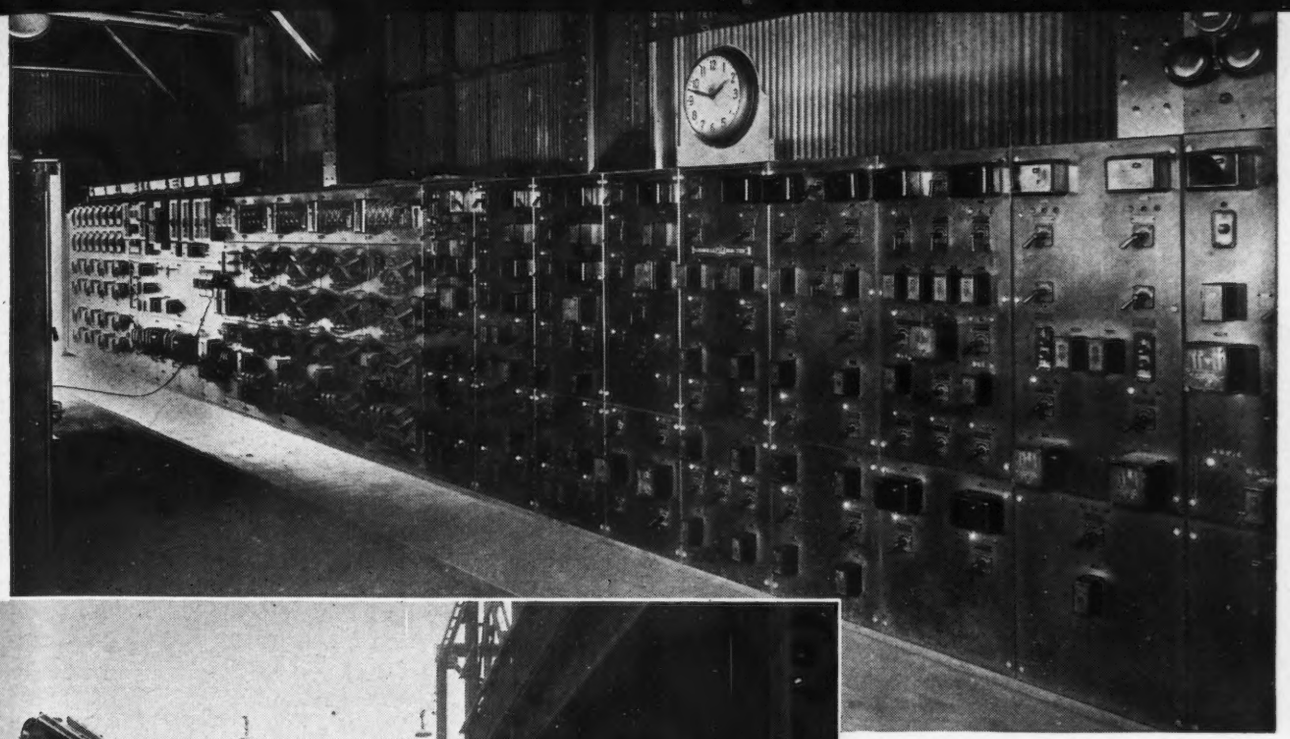
All three machines discharge to a common chute, 14 water sprays playing on the hot sinter as it goes into the cars over a 1¼-in. mesh stationary grizzly screen. After the sinter has been loaded, 42 additional sprays continue to wet it down, each car remaining under the nozzles while two other cars are being loaded, ordinarily about 40 minutes. Approximately 4,000 tons of sinter is produced daily, calling for about 3,700 tons of ore fines and 1,100 tons of flue dust. Because of the relatively low iron content in the Red Mountain ore fines, sinter from the plant weighs only about 80 lb. per cubic foot, so that a carload represents, on the average, about 70 tons.

Examples of Ingenuity

Pallet breakage has been reduced almost to the vanishing point by means of a novel braking device developed by the engineering department. It consists of two 8-ft. lengths of rail with curved ends, on the under side of the machine just in advance of the head sprocket. The rails rest on the under side of the pallet rollers and are held in place by moderately strong spring pressure, which exerts enough braking action to hold the pallets together as they pass over the discharge end, preventing the vertical drop, normally the cause of breakage. As the drive sprocket pulls the hearth back into position, looseness is taken up smoothly by a horizontal separation of the individual pallets as they pass out from under the pressure area.

Another device which serves to prevent serious damage from minor link breakage is a curved guard of rails between the drive sprocket and the feed hopper to catch any link that may fall out, before it can jam the mechanism and cause the whole chain to be torn apart or other damage.

Operating continuously, the ma-



SEQUENCE CONTROL BOARD in one section of the control room.

CLEANING UP at chute where sinter is discharged from sintering machine into railroad cars has been greatly eased by using this pivot-mounted loading conveyor.

chines seldom need to be cleaned and re-ignited. Repairs necessitate this at times, so the sinter-plant crew developed a way to avoid the normal use of paper for covering the hearth to preserve the blast. Paper is messy, relatively expensive, and uncertain, as it tears easily. As illustrated on page 77, a roll of brattice cloth on a windlass is provided at each machine and a slot is made at hearth level in the back end of the draft hood over the discharge end. When starting up, the brattice cloth is fed forward through this slot and over the hearth up to a point or two away from the ignition chamber. Then as the sinter is ignited and the machine started under draft, one man can easily roll up the cloth, which effectively preserves the draft until the sinter bed takes it. As the sinter starts to discharge, the cloth is completely rolled up on its windlass, ready for the next time.

Cleaning up around the sinter car-loading station is greatly expedited by means of a pivot-mounted loading conveyor which takes sinter at its foot and discharges it into a car. Formerly it took 12 men a full shift once a week to clean up around the sinter discharge chute, shoveling the sinter by hand to a platform and then into the car. Now five men, with the aid of the loader, can do a better job in five hours.

Every precaution is taken throughout the entire conditioning plant to get rid of fine dust, to improve working conditions and avoid need of respirators, and also to protect bearings and other moving parts from abrasion. All dusty locations are hooded and the dust is caught in dry collectors. The large volume of air from the machines, for example, passes through a series of collectors, from which the fines are automatically returned for sintering. Dust from crushers and screens is likewise collected and fed into the fine bins or sold as a filler or pigmenting material.

Conveyor rollers in dusty sections have special dust guards developed by the maintenance staff. They consist of cylindrical cans bolted over the bearings, with a rubber gasket. These soon fill with grease and effectively prevent dust from reaching the bearings. The caps also serve as safety guards.

To reduce belt and hopper wear, rock boxes and impact pads are installed at the discharge ends of all conveyors.

Sound-Proof Phone Booths

Noise is inevitable around a crushing and screening plant, yet telephone communication is essential in so large a plant. To solve the problem, specially designed acoustic booths to house the telephones were installed. No doors are needed.

Gas-fired heaters are provided throughout the plant in place of wood- or coke-burning salamanders. Experience shows that the cost of piping and providing natural gas is more than offset by time saved, and the fire hazard is practically eliminated. During warm weather, electric water coolers provide fresh cold water at convenient locations.

The Unsolved Problem of Rock Bursts

R. G. K. MORRISON, Superintendent, Nundydroog Mines, Ltd., Oorgaum, Mysore, South India

Mr. Morrison has had years of experience with rock bursts in the Kolar gold field of India, where mining is carried out to depths, in the central area, of as much as 9,000 ft. A few years ago by arrangement between the Ontario Mining Association and John Taylor & Sons, of London, who operate the mines of the Kolar field, he made an extensive report on the rock burst situation in Ontario. In the course of this study he visited some forty mines in nine districts of Northern Ontario, including Kirkland Lake, Porcupine, and Sudbury. It is evident that he writes with authority.

LACK OF AGREEMENT on fundamental principles has been a conspicuous feature of the extensive and prolonged discussions of the rock-burst problem. For this reason, much of the literature on the subject has been more confusing than enlightening. With rock bursts one is invariably faced with effects rather than causes and, as the cause appears to lie within the walls of a mine, it can be determined only by translating observed effects back to accepted physical principles.

Fundamentally, the cause must be the same for rock bursts, whether they occur in North America, Africa, Asia or elsewhere, and broad principles to be acceptable must have a universal application. Such principles must also supply a source for the energy reasonably believed to be liberated in these phenomena. This can rise to hundreds of millions of foot-tons, to be derived only through failure of millions of cubic feet of rock under pressure.

Selected from the many details of the problem, the following factors must be weighed in any explanation:

1. The distribution of stress over mine excavations.

Stresses are usually regarded as a function of depth (superincumbent weight), but those of a regional nature, due to crystallization, faulting or other causes, may frequently be a factor.

2. Physical properties of rock.

Perhaps the most important are the elastic properties, followed by strength in bending or shear. The strength of rock in compression is important in that, when it is exceeded, no opening is stable and operations must cease, save where the time factor is favorable and the strength of the rock is less than that of the supporting medium.

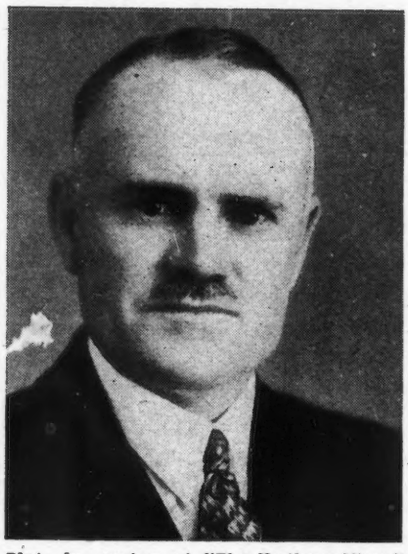


Photo by courtesy of "The Northern Miner," Toronto

R. G. K. MORRISON

Failure of large pillars of ground in direct compression in the sense that a laboratory specimen is crushed is, in my view, sufficiently unusual to be exceptional, as the release of energy can almost invariably be achieved more readily in shear or slippage along planes of weakness.

The time factor in the elastic decompression of rocks may vary considerably with the period during which pressure has been applied. Where recently applied stresses due to mining predominate there is reason for believing that elastic recovery is much more rapid, or violent, than is the case where stresses have existed over prolonged geological time. This would explain the violence of bursts that have occurred at times when extending development into pillars.

At the present time, the United States Bureau of Mines is carrying out an interesting series of tests on the physical properties of rocks from various localities, and one feels confident that these experiments will greatly reduce the indefiniteness that now surrounds the possible behavior of different rocks under pressures associated with practical mining.

3. Structural features.

These, in the form of jointing systems, fault planes, contacts or other directions of weakness, are of importance to the extent that they are able to influence stress distribution.

4. Size and distribution of mine excavations.

These are the factors controlling the influence of stress zones upon each other. Quite aside from the possible effects of one opening on another in the plane of the lode, in pillar areas of extensive stoping domes, openings in either the hanging or the footwall are subject to rockbursts. In general, however, in areas free from superimposed pillars, with gravity acting with doming stresses in the hanging but against them in the footwall, other things being equal, the footwall is a much safer area.

In the qualitative sense, I regard the stress zone surrounding any mine opening at depth as an established fact. Also, if a dome is described as that surface or zone within which rock has failed and dissipated all but its positional en-

ergy, but outside of which elastic compression and confining pressure still exist, the dome must also be regarded as a fact.

Stress zones demand equilibrium which can be achieved only through the development of domes. This process under the influence of a stress zone or zones is, in my opinion, the basic cause of all rock bursts, whether they be the mere spalling of a level, or represent the failure of millions of tons of rock in a pillar area.

Precautionary Steps

Counter measures may be considered under the following headings:

1. Prediction.
2. Minimizing the effects.
3. Reducing or eliminating the occurrence.

Prediction. A vast amount of work and observation has gone into the problem of predicting rock bursts. I have seen rock-burst incidence plotted against phases of the moon and barometric variations, the rate and amount of sag of stope walls, the rate and distance of face advance, and seismographic records. In many cases, interesting coincidences are to be noted—often enough to inspire hope, but, as yardsticks with a general application, all have been discredited with time.

A discontinuing of the sounds usually associated with the working of stope walls is invariably given consideration by the practical man and, by the same token, the reverse is also true. While such factors seldom give ground for more than suspicions and cannot definitely be tied to the prediction of a rock burst, it is a very bold man indeed who will completely disregard any sudden unexplained departure from what previously had been regarded as the normal for a given working place.

Interesting possibilities have been opened up with the development of electronics. U. S. Bureau of Mines appears to have attained some success with these methods where structural conditions were comparatively simple. However, in the more complicated conditions of Kirkland Lake and Sudbury, an extensive trial of such methods still seems to leave much to be desired.

While it is to be hoped that accuracy in the prediction of rock bursts may ultimately be achieved, the difficulty appears to be an inability to reduce the many variables present to manageable proportions.

Minimizing the Effects. The type of support introduced for the various types of mine excavation is the most effective precaution in this respect, and such supports are largely controlled by local factors.

A. In Stopes. As a condition of stability can be assumed to have existed before stoping starts, it is obvious that to regain a similar stability with the removal of ore, something equally effective must be put in its place. This has proved impossible, and the convergence of stope walls must be accepted as an inevitable consequence of mining at depth. Support then must be of a type that, while avoiding its own destruction, is capable of offering resistance to the end. Various types of filling meet this requirement to a high degree. As the initial, compared with the ultimate, resistance of fill is slight, the best fill must be capable of exerting the maximum resistance earliest. This implies a fill proportioned to contain the fewest voids. While this can be obtained with various sizings, a proportion of coarse material as a base has advantages in the early stages of compression.

A difficult problem with filled stopes in moving ground is to provide adequate means of keeping the fill in place until such time as the walls have converged sufficiently for the compression to serve this end. However, in wide orebodies or with very fine fill this objective, which is a function both of the stoping width and area stoped, may never be achieved.

With wide orebodies the control of fill is a distinct and special problem. Best results are to be expected when mining has been placed on a sequence which provides for this.

The problem of controlling fill grows less acute as the width decreases. With width where stulls apply and these, though cushioned, will no longer adequately stand the squeeze, concrete mats of a thickness depending on the stope width have given good service. The life of such mats can be prolonged with reinforcing, but they do crush and break up, and the yardstick of their value is determined by their ability to restrain fill until it has been squeezed enough to stay in place.

For widths of 10 ft. or less, and regardless of the dip, timber cribs along the back of the level are a most economical and effective form of support to place fill on.

With open stoping the method of support is largely influenced by the dip. With flat dips waste-rock walls are useful, as well as a variety of timber supports. With steeper dips, however, waste-rock walls lose their attractiveness. The Kolar gold field may well be an exception in this respect, as here with stoping widths up to 20 ft., an almost vertical dip, and depth in excess of 9,000 ft., stope support is largely dry-walling built of granite blocks.

In underhand stoping, walls are built on either stulls well lofted or on crib sets, while with overhand stoping they may be built either from the level supports or on back of the level crib sets. Such walls have been built with mortar, but, even with a course of timber cushioning through them, it has been found that the extra rigidity brings on early destruction.

Development of granite walling in the Kolar field is perhaps due to an economic coincidence, in that locally there is a well-developed granite industry capable of delivering suitable blocks at the shaft top at a reasonable cost. The practice has resulted from trial and error over many years and as such is generally acceptable, but it would be wrong to infer that it is a final answer to the problem of support under rock-burst conditions.

In general, with open stoping on narrow widths and steeper dips, timber supports of one type or another, depending on the degree of squeeze, are applicable. Where converging walls are the dominant factor, cribbing varying from the 4-pointed to the solid-timber crib set has been established as very effective and its useful life as a support depends on atmospheric conditions rather than on the degree of squeeze.

Mining Sequence

The problem of support in any orebody is clearly related to the sequence of mining established, and the most suitable sequence will greatly simplify the problem. A sequence based on retreating should reduce support and maintenance costs to a minimum and, at the same time, offer a maximum degree of safety to workmen.

B. On Levels. Timber-setted levels in rock-burst areas where widths are of the order of 10 ft. or less are definitely undesirable. The most effective support is steel-setting, through which a traveling way is possible in spite of severe distortion.

Where second-hand steel rails are available at scrap prices, these have been successfully used, otherwise at greater cost rolled-steel sections are available in varying weights suitable for different-sized openings.

When the ore greatly exceeds drift width, timber cribs on either side of the level provide very effective protection.

Level protection and maintenance through rock-burst areas usually is very expensive, under even the most favorable conditions, and where long lengths are involved, retreating methods permitting the abandonment of levels with the passage of the stoping have much to recommend them.

C. In Shafts. In common with other mine openings, shafts under pressure, regardless of their designed shape, tend to work themselves to a form which is stable under existing pressure conditions. In an isotropic rock with pressure exceeding the strength in shear, one assumes that the stable form would be circular. However, in practice, rocks are never isotropic, and the stable shape is largely governed by the nature of the major weaknesses through the rock mass and their directions with relation to the shaft.

As an example, in steeply dipping schistose country with the schistosity representing the major direction of weakness, a vertical shaft will tend to work itself in a direction normal to the plane of schistosity, and the same holds for an incline shaft roughly paralleling that plane.

Under these conditions, if a vertical shaft is laid out with the long cross-sectional axis normal to the strike of the schist, difficulties due to subsequent working of the ground surrounding the shaft will be greatly reduced.

With inclined shafts the direction of the long cross-sectional axis is usually of necessity governed by the inclination of the orebody rather than by directions of weakness through the rock, and for such shafts the best safeguard known to me is a timber-cushioned masonry or concrete wall down its center to support floor and back.

Where rock bursts are a prominent factor, the ordinary type of timbered vertical shaft is a distinct liability. Circular or elliptical shafts with steel equipment, and lined with either brick or reinforced concrete, are much more satisfactory. Rock bursts can damage substantial lengths in this latter type of shaft, but the shaft can be put into operation again in minimum time. Similar bursts in a timbered shaft, aside from the more difficult reclamation problem, invariably demand much more expensive maintenance.

Shafts at depth should be in the footwall as far from the influence of stoping stresses as possible. They should also be clear of major planes of weakness, such as regional faults.

Reducing or Eliminating the Occurrence. There are many who hold that adequate and satisfactory support will greatly reduce the occurrence of rock bursts. This is entirely a matter of opinion. My own view is that support can play only a secondary role, if any, compared with a suitable sequence of mining. In areas comparatively simple structurally and with rocks of only moderate bursting characteristics, it may be possible to eliminate rock bursts entirely by a suitable sequence of mining. But the success of any sequence will diminish with increasing structural complications and more resistant rocks.

Earlier in this article, I have expressed the opinion that all rock bursts result from the effect of stress zones on the rock surrounding mine openings in the process of establishing stable domes over such excavations.

Within this framework, the size of the orebody controls the dimensions of the ultimate dome that will form in each wall with stoping. The practical problem in arriving at a sequence is to stope such an orebody in a manner that will permit the most gradual growth of these domes.

This implies a stoping program that develops with the enlargement of a single excavation from the weakest point or plane in the orebody. Pillars are thus eliminated and stress concentrations reduced to a minimum, leaving the opportunity for stress to become the servant, rather than the master, of the operation.

Orebodies can be so complicated structurally that this ideal approaches a pious hope, but there is no doubt that there is one order for stoping that will give most satisfactory results. With the variables involved, selection can be no more than shrewd guessing, but the shrewdest guess will be associated with the most accurate conception of the process going on within the walls of a mine as operations progress.

EFFECT OF A ROCK BURST on a timber-setted level in one of the gold mines of the Kolar field. Photo supplied by Jack Spalding, engineer, John Taylor & Sons, London

India's Mineral Policy Keyed to Nationalism

REV. MICHAEL D. LYONS, Missionary, and Formerly Minerals Consultant for the Foreign Economics Administration

Political and financial leaders of India believe that maximum economic and social benefits from her natural resources can be realized only by controlling the production and also the processing and export of her minerals

THE ATTITUDE of Indian leaders toward the utilization and exportation of the country's very important mineral resources by foreigners is today of considerable interest to mining capitalists in the United States. With greatly increased participation in the determination of domestic and foreign policies of their own country, as a result of recent concessions by the British, Indians are in a position to control their internal economy much more effectively than in the past. Another reason for interest stems from the fact that rising Indian nationalism in matters concerning mineral resources will probably influence, and to no small extent, opinion in other populous lands of the awakening East.

In India opinions on this subject are expressed mainly by two groups, who are in fair agreement. The more vocal group is made up of those who represent dominant financial interests of Calcutta and other important centers of Indian business activity, and who control the most important chambers of commerce. These Indians are largely of the traditional merchant castes.

A group less often heard from, but none the less influential, is composed of Indian scientists, Government officials, and political leaders.

The financial group is unanimous in its opposition to the free and unlimited exploitation of the mineral wealth of India by foreigners, and resents the extensive domination of Indian mining exercised by Europeans in the past. Those comprising it interpret the agreement in the Atlantic Charter calling for equal access to the raw materials of the world to mean merely that the more highly industrialized nations will have abundant and cheap raw materials at India's expense.

One reason which influences many of the financial group is a not always justified fear of the rapid depletion of India's mineral deposits if foreigners are allowed a free hand in mining and exporting from India. It is the opinion of some of this group that India should part with her minerals only through barter for minerals in which India is considered deficient. It is thought that India should give her manganese ore, mica, chromite, bauxite, iron, titanium, magnesite, thorium, and kyanite only in exchange for those minerals and metals in which she is lacking, such as lead, zinc, tin, tungsten, mercury, nickel, liquid fuels, and industrial diamonds. Of these, tin and tungsten are available in unusual amounts in nearby Burma and Malaya. Lead and zinc are found in Upper Burma, and valuable, untapped deposits of nickel occur in Nepal, on the northern border of India.

In practice, however, the proposed barter might be difficult if not impossible. The economies of Burma and Malaya, for instance, are so primitive that they could utilize only a negligible part of the minerals India could trade for tin and tungsten.

Most Indian business men also believe that India is paid far too little for the minerals it exports. The Dewan (Prime Minister) of Travancore, Sir C. P. Ramaswami Aiyer, has stated that valuable mineral sands containing titanium and the rather rare elements, thorium, cerium, and zirconium, were carried away in former days at prices virtually equivalent to what would have been paid for mere ship's ballast. In an effort to secure for his people a greater share in the profits made from the mineral wealth of the State, he later refused to renew the leases of two foreign companies until they would agree to initial processing of the sands in the State.

As arguments for increased prices for the country's minerals, the poverty of the Indian miners and the pitiful conditions under which they are obliged to work are frequently cited by Indian leaders and spokesmen, who claim that these evils cannot be remedied to any considerable extent without a more substantial return on the minerals that are exported from the country.

I have had many opportunities to observe mica- and coal-mining operations in and near the areas where I served for years as a missionary, and I believe that the working conditions of laborers in Indian mines as a whole are indeed not what is wanted in the modern world. The mica mines may be taken as typical.

Mica Mines Primitive

In these mines the circulation of air is generally poor, and ventilation is often vitiated by candles and kerosene lanterns carried by the miners. Mechanical dry-drilling, still carried on in most of the larger mines, results in much silicosis, and there are many deaths from silicotuberculosis. Sanitary arrangements in and about the mines are not worthy of the name. Most of the water is not suitable for human consumption, so that the miners suffer greatly from ankylostomiasis, hookworm, typhoid, and other diseases.

In spite of the Employment of

MINING METHODS in India are primitive. Here a human chain is used to bring out mica.

Children (Amendment) Act of 1939, children are freely employed in the mines. Other legal provisions, such as the Workmen's Compensation Act and the Indian Mines Maternity Benefit Act, in practice confer few benefits on the miners, largely because of their ignorance.

Most of the mica mines are situated in malaria-infested jungles. Many of the miners must walk four and five miles to work, often arriving at nine or ten in the morning. They must leave the mines early enough to reach their homes before darkness falls over jungles inhabited by dangerous animals.

Wages Are Low

The wages paid to Indian miners are about one-twentieth the rates of pay for underground work in the United States. They are so low, even by Indian standards, that practically all the wives and children of the miners are compelled to seek employment outside their homes, often as cutters and sorters of mica on the surface, and even as laborers underground.

It has been stated by mine operators, both Indian and European, that the payment of wages greater than those now in force has often had the effect of causing a labor shortage. Coal miners who go into the pits about five days a week, for instance, will go down less often if they are paid more. This is true of many miners who have become inured to an undesirably low standard of living. But I have maintained that this can be no valid excuse for holding down wages, as additional compensation can be given without decreasing output by the simple expedient of granting this extra compensation in the form of services such as nurseries, cinemas, and schools.

From the foregoing the American reader may come to have a rather unpleasant impression of mine operators in India, and by inference, of mine operators in other colonial and backward countries. Actually, the factors affecting welfare of labor in India are complex, and it would be wrong to suppose that all mine operators are blameworthy. As in other fields of human activity, the opportunities of individuals to change conditions are definitely limited.

A more efficient use of labor would make it possible for mine operators to increase wages to some extent. It is well known that there is a tendency in India to deprecate the widespread use of modern machinery, but moderate and majority opinion would welcome the gradual introduction of mechanical means necessary to increase labor efficiency. Dr. Rajendra Prasad, former president of the Indian National Congress Party and now a member of the Government of India, who favors the prudent use of machinery, nevertheless pointed out to me that rapid and large-scale mechanization would throw out of work large numbers of workmen who lack the resources necessary to tide over any considerable period of unemployment. Compared with the hardships which attended the Industrial Revolution in England, it is feared that such mechanization and industrialization in India would go much farther, bringing actual starvation and famine to masses of people who would have no purchasing power.

Machinery Needed

In the field of mining, however, the use of more machinery should not prove calamitous. The number of persons employed in mining is less than 1% of the total population. In addition, most mine laborers may also be farmers in season. With the present shortage of machines and tools throughout the world, however, it is not likely that this want in India will be remedied in the near future.

Indian leaders today not only expect more for their raw materials, but they are eager to utilize their minerals in so far as possible in new industries to be established by them, recognizing that India stands to gain if the value of its raw minerals is enhanced by local labor before export.

The utilization of Indian min-

erals in new Indian industries entails capital, technical knowledge, machinery, and markets. For capital India has an unusually large amount of hoarded wealth to call upon. Indians believe that they will have little difficulty in raising the necessary capital in their own country for many new industries. The Reconstruction Committee of the Viceroy's Executive Council recommended that, ". . . the participation of outside interests may, if possible, be confined to the provision of technical assistance and of machinery and experts, the firm being remunerated for services rendered and by royalties on patents. In cases where participation in capital is required, care should be taken to see that the capital is issued in India, that the majority of the capital, as well as the directorate, is Indian." J. C. Setlavad, a former president of the Federation of Indian Chambers of Commerce and Industry, stated: "Government should make it perfectly known that it will neither countenance nor bless any important industry in the country being controlled by non-nationals. . . . I have reason to believe that it is quite possible to attract foreign technical assistance on terms which would not involve parting of control to foreign hands."

India Needs Technicians

I have found Indians generally agreed that they must utilize foreign technicians in developing Indian industries, and they believe that these will be available. The country's greatest need today is machinery.

For some Indian products markets can be found in India itself, but it is difficult to envisage substantial industries manufacturing such products as titanium white, ferromanganese, or thoria, unless foreign purchasers are willing to buy materials processed in India rather than the crude minerals which they have up to now demanded.

So far this discussion has dealt with the opinions of the merchant and financial groups of Indian life. The opinions held by another element, composed of scientists and thoughtful planners among the politicians and Government officials, are similar to those of the former group. Before the formation of the new Government now controlling India, these more thoughtful Indians were in contact with those who produced the Bombay Plan and those who, under the leadership of Pandit Jawaharlal Nehru, constituted the Planning Committee of the Congress Party. In general their opinions about the exploitation of India's mineral wealth are summed up in a six-point plan proposed by D. N. Wadia, a well-known geologist:

1. The attainment of mineral and metal self-sufficiency in so far as possible;
2. The stoppage of the export of key minerals such as manganese ore, ilmenite, chromite, sillimanite, phosphates, and refractory minerals (until satisfactory prices are paid);
3. The domestic manufacture of products from Indian minerals;
4. Nationalistic revision of mineral taxation, royalty, and lease laws;
5. New export and import tariffs;
6. The progressive change-over to State ownership of coal, petroleum, and base-metal mines, within feasible limits.

I have found that whereas the spokesmen for the second group agree with the merchants and financiers on the necessity of preventing unlimited exploitation, and are determined upon a program of industrialization, they take a more liberal attitude toward the participation of foreign elements in expanding the mining industries. Several of them have told me that they favor permitting foreigners who can bring machinery to India to invest in mining operations in a limited capacty. These spokesmen were convinced that full mining rights for the proper types of foreign concerns would also be granted by the new National Government in limited areas.

Leaders Favor Labor

In India, as in most countries, the best guarantees on paper will mean very little without the good will of the Government in power. It is easy for those in authority to close their eyes to unjust exactions by bribe-takers among subordinate officials and to unjust pressure on the part of the leaders of organized labor. Illustrating what can be done to squeeze out foreigners, certain Czech, Swedish, and other engineers have said that after learning what was wanted from them, their employers were making it impossible for them to remain, even though their contracts called for several more years of well-remunerated employment.

The good will of the leaders of the new Nationalist Government will be extended in unusual degree to those who are genuinely interested in the welfare of the poverty-stricken laboring class. These leaders possess more than ordinary devotion to the welfare of their countrymen, as almost all have spent terms in prison and suffered other hardships for their ideals. The Congress Party has the distinction of possessing what is in effect a welfare department, which has sought to improve the lot of the Indian laborer through economic and social measures. The old type of sharp operator from foreign lands, guided only by considerations of profit, will find that the favors of the new Government will go to those mine operators and businessmen who are first of all guided by humanitarian considerations.

Indians Misunderstood

Dealings with Indians will not be altogether easy. There are misunderstandings on both sides. It is surprising to find American businessmen apprehensive of the effects of Hindu-Moslem riots on business and investments in India. It is my opinion that this tension is no more to be feared than the friction between racial groups in the United States. On the part of Indians, too, there is a baseless fear of foreign investments. In building up Indian industries, partnership with foreigners is not sufficiently appreciated. To many Indians it is a concept to which they have not been accustomed.

If the Indians are forced to accept assistance from outsiders, they are likely to favor the British, for several reasons. They feel that the American Government has accepted the position that India lies in a British sphere of influence and that American businessmen cannot get support from their own Government comparable to the British. There is also the circumstance that India possesses more than one billion pounds of sterling exchange. This will undoubtedly influence the future economic pattern.

The tremendous potential importance of the Indian market and resources, and the need the Indians have for our assistance, make it imperative that both the people of India and the people of the United States should come to know each other better and learn to work together. The present position of misunderstanding and fear leaves much to be desired on both sides.

A Survey of Mining Progress

Part III

A. H. HUBBELL, Managing Editor

An eye is turned in the present installment to the auxiliary functions of ventilation and air conditioning, drainage, mine communications, and core drilling for exploration purposes. A tabulation is also included which illustrates current preferences in mine cars. The major operations by which ore is broken and taken to the surface were considered in the February and March issues.

Omitted from the preceding installment, which dealt with underground haulage and transport among other topics, because of delayed receipt of data, the accompanying tabulation of types of mine cars used by some thirty-odd mining companies, which have been selected at random throughout the industry, shows that current preference leans to a side-dump car, particularly the Granby type. Despite this trend, mine cars appear to be an item of equipment in which operators express their individualism more than in any other item. Capacities range from 1 to 12 tons, the small one-ton car being seemingly less prominent than formerly. Communications from the operators reveal also that all save a very few of the cars, the latter being of small capacity, are equipped with antifriction bearings.

Air Conditioning Impeded by War Ban

PROGRESS in mine-air conditioning was impeded by the war, during which period new installations were banned. No definite trends are as yet reported.

Temperatures underground in summer caused by heat generated by oxidation of pyrrhotite stope-filling have been lowered at Noranda by passing air entering the mine over ice previously made in an empty stope during the winter. The ice has been made by spraying water into the entering cold winter air in the stope selected. This air is thus warmed at the same time by the resulting heat exchange. Details are given in the January 1947 C.I.M.M. bulletin. Countercurrent flow of air and spray water, it is thought, will improve efficiency and give cost of about 7c. per ton of refrigeration, compared with 37 to 52c. obtained for artificial refrigeration by St. John Del Rey (Brazil), Robinson Deep (South Africa), and, Magma (Arizona), or with 14c. per ton in the Mountain Con mine at Butte.

Spot coolers, acquired before their purchase became impossible because of the war, have given the users satisfactory service. Working conditions have been improved in dead ends or in places remote from the main ventilation current with them in a large Coeur d'Alene mine, where the units deliver 3,500 cfm. of air through as much as 4,000 ft. of fan pipe to the end of long crosscuts and raises, discharging it at 79% relative humidity as compared with 96% at the intake. The cooling effect is due to the lowered temperature and lessened amount of water vapor.

Another Idaho company was unable during the war to keep its single unit in continuous operation, through inability to replace the copper tubing. A third company, in Arizona, with two units, found them satisfactory in headings but had to stop using them when manpower shortage forced cessation of development work. More recently, one unit is serving to cool a pump station near the bottom of one of the deepest shafts.

Increased use of spot coolers is anticipated where bad air conditions are localized. Why attempt to condition the air of an entire mine, it is asked, if such units in a few places will be satisfactory?

Adequate ventilation plays a great part in providing air of the proper characteristics and in sufficient quantity to make working conditions comfortable. Although natural ventilation is in places sufficient by itself to accomplish this, mechanical ventilation has won an important position in mining practice, one that tends to widen though not to become exclusive. The practice varies according to the degree of need. Cerro de Pasco's Casapalca mines, for example, require forced ventilation, although natural ventilation appears to be adequate in most of that company's mines in the high Andes. (*M.&M.*, Nov. 1945, page 532).

Mechanical Ventilation. Attention to mechanical ventilation has come to be regarded as good business in that it tends to make for better work, easier labor relations, and less disability from dust. This increased appreciation is indicated in the number of large fans found in service, 32 Ontario mines, for example, having over 50 in the late years of the war, the largest single unit being of 200,000-cfm. capacity.

The axial-flow propeller-type fan, as compared with the centrifugal type, enjoys increasing favor, because of the ease with which it can be reversed from blowing to exhausting by changing the direction of rotation, although a manufacturer points out that if the efficiency is high when blowing, it will be comparatively low exhausting and that the capacity will be less in one case than in the other. Its popularity at Climax, where an important number of the type are in use, is ascribed in part to comparative ease of installation (T.P. 1540, A.I.M.E.).

To some extent, auxiliary mine ventilation has been standardized on an axial-flow fan 18 to 20 in. in diameter or a centrifugal fan of 5,000 to 6,000 cfm. capacity, according to one manufacturer. Two types of blowers are needed, according to another—a medium-pressure axial-flow propeller fan and a high-pressure centrifugal fan—if the largest volume of air is to be obtained for the least horsepower. The centrifugal-type blower is designed to develop higher static pressures, which are useful when ventilating lines become longer or when smaller-diameter pipe is preferred for a given line without reducing the desired volume of air.

A recent installation, in Mexico, and another that is planned in Idaho, call each for an axial-flow fan, the former working on a 200-hp. motor and handling 75,000 cfm. at 12 in. S.P. at 10,000 ft. elevation, and the other on a 20-hp. motor, to deliver 30,000 cfm. at 2.25 in. of water.

A Case in Australia

The Zinc Corporation at Broken Hill, in Australia, still prefers improvement in ventilation to air conditioning for coping with high rock temperatures, namely, 92 deg. F. at 2,000 ft. The old 170,000-cfm. upcast fan has been superseded by a new 130-in., 250,000-cfm. axial-flow fan designed for an ultimate capacity of 400,000 cfm., which has been installed near the collar of the upcast airshaft. It has 18 rotor blades and 19 guide vanes of high-tensile silicon-aluminum alloy and is operated through a wedge-rope drive by two 200-hp. synchronous induction motors. Future increases in the initial capacity will be met by altering pulley diameters and, when necessary, replacing motors. Capacities are as follows:

R.p.m.	Volume, Cfm.	In., Water Gage	Hp.
382	250,000	2.5	135
462	300,000	3.6	238
524	350,000	5.7	373
600	400,000	7.5	556

The surface structure is of concrete, turning vanes being installed in the duct at the right-angle bends above the shaft and at the evasee.

Subsidiary ventilation is effected by the Corporation mainly with 16-in. air-operated axial-flow fans through 16-in. galvanized steel or flexible tubing or, where close to the source of electric energy, by centrifugal-type electric fans. These

Types and Sizes of Mine Cars Currently Used

a—Main Haulage b—Intermediate Haulage c—Development, Waste, Fill

No.	Company	State	Type of Car	Capacity	Box Size In.	Approx. Number
1.	Miami	Ariz.	a Gable-bottom	4 tons	72x60x51	334
			b End-dump	1 ton	48x30x24	12
2.	Cons. M. & S. Co.	B.C.	a Granby	12 tons	150x52x33	70
			b Granby	6 tons	90x54x33	90
3.	Granby Cons.	B.C.	a Granby	6 tons	108x60x38	62
			b Side & end dump	1 ton	36x30x30	6
4.	Eagle Shawmut	Calif.	a Gable-bottom	6 tons	96x60x48	5
			a Gable-bottom	3 tons	72x42x36	3
5.	Penn (Eagle Shawmut)	Calif.	b End-dump	1 to 1½ tons		20
6.	Mountain Copper	Calif.	a Gable-bottom	6 tons	120x48	15
			a Gable-bottom	5 tons	84x48	13
			b Rocker	2 tons	60x36	6
7.	Climax	Colo.	a Granby	10 tons	96x72x48	325
			b End-dump	¾ to 1 ton	36x30x30	50
8.	Bunker Hill & Sullivan	Idaho	a Bottom-dump	3¼ tons	48x40x29	86
			b Bottom-dump	2½ tons	60x40x36	200
9.	Hecla	Idaho	a Bottom-dump	120 cu. ft.	120x47x43	22
			a Rotary	135 cu. ft.	120x50x48	15
			b Bottom-dump	80 cu. ft.	96x32x42	50
			b Side-dump (box)	30 cu. ft.	58x38x23	20
			b End-dump	22 cu. ft.	52x30x24	50
10.	Sherritt Gordon	Man.	a Granby	85 cu. ft.	96x45x32	36
			a Side-dump	30 cu. ft.		12
			b Side & end dump	16 cu. ft.		
				20 cu. ft.		
11.	North Range	Mich.	a Rocker	4½ tons	103x63x57	21
			a Rocker	3 tons	87x52x53	40
12.	Pickands, Mather	Minn.	a Rocker	3 tons	76x53	60
13.	Eureka Corp.	Nev.	a Granby*	3 tons		6
			a Rocker*	2 tons		6
14.	Mt. Hope Mine	N. J.	a Granby	6 tons	90x50x30	40
15.	Potash Co. of Amer.	N. M.	a Rotary	4½ tons	114x64**	325
16.	Hanna Ore Co.	N. Y.	a Side-dump	4 tons		25
17.	Republic Steel	N. Y.	a Granby	7½ tons	120x53x39	30
			a Granby	7½ tons	102x63x39	30
			a Granby	6 tons	114x53x36	60
			a Granby	4 tons	96x51x29	30
18.	Dome Mines	Ont.	a Granby	4 tons	96x48x30	70
			c Side-dump	2 tons	84x48x30	25
19.	Hollinger Cons.	Ont.	a Rotary	3 tons	81x41x32	350
			a Granby	3 tons	84x39x32	200
20.	Matachewan Cons.	Ont.	a Rocker	2½ tons	80x48x32	30
			a Rocker	1¼ tons	32x33x34	40
21.	Pamour Porcupine	Ont.	a Rotary	3 tons	82x42x29	180
			b Rocker	1¾ tons	56x40x33	20
22.	National Gypsum	Pa.	a Granby	5½ tons	114x56x28–42	14
23.	Warner (gypsum)	Pa.	a Granby	3.6 tons	100x67x28–42	63
24.	Noranda	Que.	a Rotary	3½ tons	72x42x30	180
			c Granby (fill)	5 tons	98x43x32	12
			c Rocker	2 tons	60x36x32	100
			b End-dump	1 ton	48x30x24	20
25.	Waite Amulet	Que.	a Rotary	59 cu. ft.	84x42x30	60
			b Rocker	16 cu. ft.	39x30x27	24
			b Rocker	15 cu. ft.	34x37x28	18
26.	Canadian Refract.	Que.	a & b Side-dump	1.7 tons	56x56x30	20
27.	Sladen Malartic	Que.	a End-dump	1½ tons	33x34x50	70
28.	Homestake	S. Dak.	a Bottom-dump	5 tons	78x42x39	44
			a Granby	3 tons	96x42x32	190
			b V-bottom	1 ton	42x30x33	700
			b End-dump	1 ton	44x31x24	640
29.	Tennessee Copper	Tenn.	a End-dump	6 tons	105x56x26	80
			a End-dump	4 tons	76x56x26	72
			b End-dump	1¾ tons	50x36x24	12
30.	Combined Metals	Utah	a & b Side-dump	2 tons	96x30x24	40
			a & b Side-dump†	2 tons	96x30x24	50
			a & b Side-dump†	2 tons	96x30x24	60
			a & b Side-dump†	2½ tons	96x39x24	40
31.	Chief Cons.	Utah	a End-dump***	18.7 cu. ft.	33x29x32	200
32.	New Park	Utah	a Rocker	2.75 tons		45
			a Side-dump	1.5 tons	48x24x20	25
			b Side-dump	1.5 tons	48x24x20	100
33.	Wright-Hargreaves	Ont.	a "U" Side-dump	1¼ tons	58x27x31	186
			a "U" Side-dump	1 ton	44x27x30	114
			b End-dump	1 ton	42x30x26	12

* On order. ** Are raising sides and end to give 36½ in. depth and 5½ tons' capacity.
***Plant to build future cars so as to have solid box on truck, eliminating much maintenance.
† In a different mine. The car is somewhat on the Granby type.

are being replaced by axial-flow types, in line with the trend.

Mine Drainage Systems Can Be Improved

Underground Pumping. In the revamping of mine drainage systems and the replacement of old and inefficient pumps lies a chance for betterment of practice in many mines. For up-to-date pumping the multi-stage centrifugal and deep-well turbine types take first place today. Automatic control and protective devices can ease manpower shortages, functioning reliably. Maintenance can be reduced and pump life lengthened by use of materials that resist abrasion and corrosion. Here is a field where the manufacturer collectively is several jumps ahead of many pump users.

Among the few companies reporting improvement in pumping practice is the American Zinc, Lead & Smelting Co., which, in its Tri-State operations, has adopted the self-priming centrifugal pump, eliminating most pump supervision.

Treatment of acid water from coal mines with lime for use in subsequent preparation of the coal has been discussed in a Bureau of Mines bulletin recently. In the cases studied, it cut corrosion losses. Savings of $800 to $3,000 a month are reported. What is done at a coal breaker can be done at a metal mine, where conditions call for it.

Mine Communications. Mine telephones have largely supplanted the old-time pipe-rapping and pull-wire bell "systems" for communication between surface and underground, but crude practices still linger in places. Even all telephones are not what the severe conditions require.

Desirable features for an underground communication system are pointed out by the U. S. Bureau of Mines in a recent bulletin, prepared for the coal-mining industry but nevertheless of interest to other companies. These features include: Connection with surface at as many points as practicable, preferably some near active working sections through boreholes or other openings; installation to minimize possibility of destruction of telephone or system should fire or explosion happen; protection against lightning; and isolation from power conductors to avoid energizing with dangerous potentials. Lack of an adequate system, the Bureau urges, has caused fatalities.

The up-to-date communication system is specially designed for underground service. A system for larger companies, developed by Stromberg-Carlson, includes both party and private lines, with standard instruments on surface and specially designed Mine-A-Phones underground, connecting with a wall- or floor-type magneto switchboard.

All attempts to use radio for underground communication have failed, in the opinion of a Bureau official (in Arizona), but electronic signaling devices used with a conductor are working satisfactorily in a number of shafts. Of special note is the two-way oral communication provided in Homestake Mining Co.'s Yates shaft, described by C. N. Kravig and Rex Tario at the Mining Congress meeting in Denver last September.

In addition to the convenience afforded, the two-way Teletalk system which Consolidated Coppermines, in Nevada, has in operation in its shaft between hoistman and skip-loader is said to have proved an effective safety measure; likewise the two-way signaling system between motorman and brakeman on underground ore trains. Use of two-way communication between locomotives in underground haulage is reported in a Carlsbad potash mine in New Mexico.

Better Core Recovery Sought in Exploration

Improved Core Barrels. In exploration diamond drilling, attention has of late been directed to the improvement of core-barrel design to increase core recovery. The Duffield barrel, first described in the *Proceedings* of the Australasian Institute in 1944 (the account being subsequently abstracted in *E.&M.J.*), is regarded by an engineer with a prominent drilling firm in the United States as having at least two advantages over previous barrels: the inner tube comes down close to the stones in the bit, and the head of the barrel automatically shuts the water off when the core blocks, so that grinding of core is prevented. However, mechanical difficulties are said to have developed in the head and with core springs at the lower head of the barrel.

Subsequently, R. S. McClintock, of Spokane, made a barrel also employing the long inner tube reaching down close to the stones of the bit but retaining the desirable mechanical characteristics that are presented by the standard head.

A third barrel embodying improvements by Dr. Stanley A. Tyler and others on the Marquette Range for the Jones & Laughlin Ore Co., in which E. J. Longyear Co. participated, particularly Frank Pickard, their field superintendent, was described at a meeting of the Minnesota Section of the A.I.M.E. in Duluth in January 1946. With it, excellent recoveries have been obtained. As results, two new barrels are being produced, by Sprague & Henwood and by Longyear, respectively, which have the long inner tube, one of them having in addition a practical shut-off head, the latter being by Longyear.

A Single-Tube Barrel

Still another new barrel is reported from the Rand, where single-tube core barrels have been used almost entirely. Its main feature appears to be a smooth inside-wall tubular core lifter which is forcibly brought into contact with the core at the end of a run, by reversal of the water current, drilling thus proceeding with the water flowing down inside the rods as usual. To clamp the core lifter, water circulation is reversed and water is pumped down the outside of the rods, going through the bit in a reverse direction. The head of the barrel is said to be complicated mechanically.

A method of plotting the projections of crooked boreholes, which can be employed by anyone familiar with trigonometry, was recently described by Prof. Lysle E. Shaffer, in a bulletin of Missouri School of Mines and Metallurgy. It is based on distances measured along the actual arc of the curving hole, or on close approximations of those distances. The projections thus made are more accurate than those which result from the approximate methods usually employed. Moreover, they can be drawn with ordinary drafting instruments.

In potash exploration work at Carlsbad, N. M., the use of a rotary drill with a rotary bit in the upper zone and a diamond bit in the pay zone is reported to give faster drilling and to cause less caving through use of mud fluid, with fewer strings of casing to be run.

Other phases of underground operations, including shaft sinking and big-hole drilling, as well as open-pit mining practice, will be dealt with in remaining installments of this Survey.

Fresnillo Develops Flexible Underhand Stoping Method

FRANK C. PICKARD, formerly Division Superintendent, The Fresnillo Co., Fresnillo, Zacatecas, Mexico

FLEXIBLE and highly efficient underhand stoping methods have been developed as the result of 20 years' experiment at the property of The Fresnillo Co., near Fresnillo, Zacatecas, Mexico.

The geologic nature of the deposit makes it ideal for this mining method. See accompanying section. Mesozoic sedimentaries and Tertiary volcanics and sedimentaries comprise the country rock. Wallrock in present workings consist chiefly of Mesozoic graywackes and shales, and Tertiary breccia (locally called agglomerate) and tuff. As the shale is the weakest member, many pillars are required to hold it. The graywackes, breccia, and tuff, however, will stand unsupported for many years.

The ore occurs in narrow veins, and is composed of the following primary mineral: galena, sphalerite, chalcopyrite, and minor amounts of silver sulphides. Also present are pyrite and arsenopyrite. Gangue minerals are quartz and calcite.

Two general classifications of the ore are: the light sulphide, which is high in silver and low in base metal; and the heavy sulphide, which is comparatively low in silver and high in base metal. The light sulphide section is almost entirely above the 340-m. level, where the country rock is graywacke, breccia, and some tuff; the ground is medium hard. In the western section the ore and walls are hard and strong. The heavy sulphide zone extends from the 340-m. level down. In the eastern section the ore and walls below 695 m. are weak and medium hard. Hot water, 135 deg. F., has been encountered here.

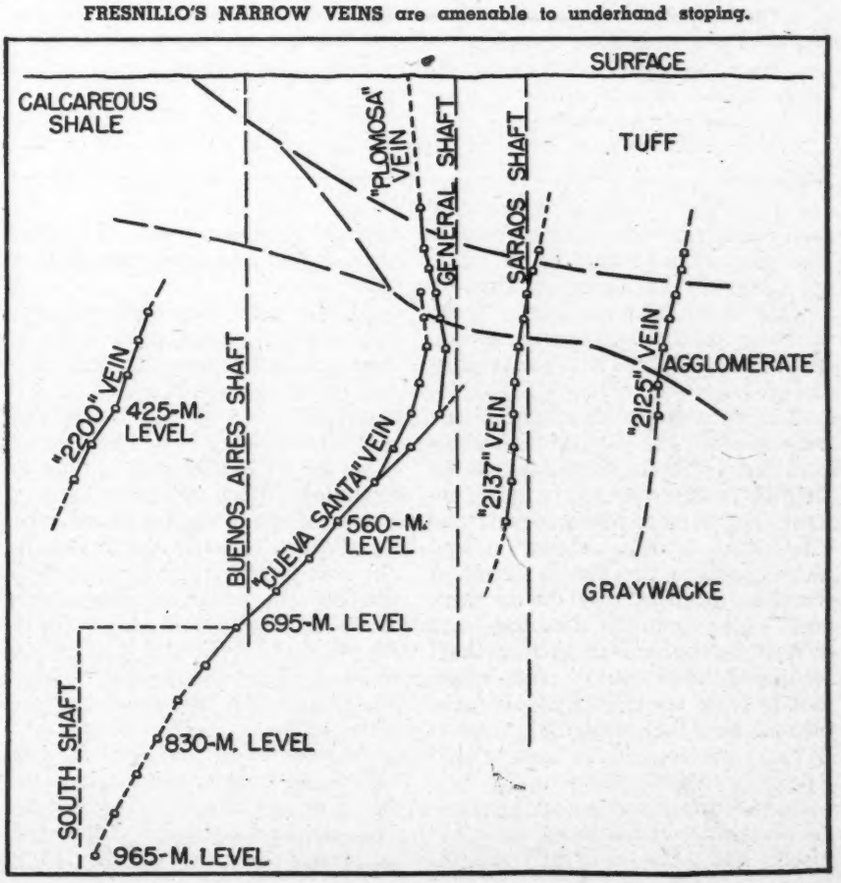
Veins in the upper area split up to form a stockwork. This formed the deposit in the Proaño hill, which was mined by the glory-hole method for a width of 200 m. Oxidation of the veins extended down about 100 m. The present ore deposit has been developed and mined over a length of 2 km., and from the surface to the 965-m. level (3,165 ft. below surface). See section view of mine that is presented below.

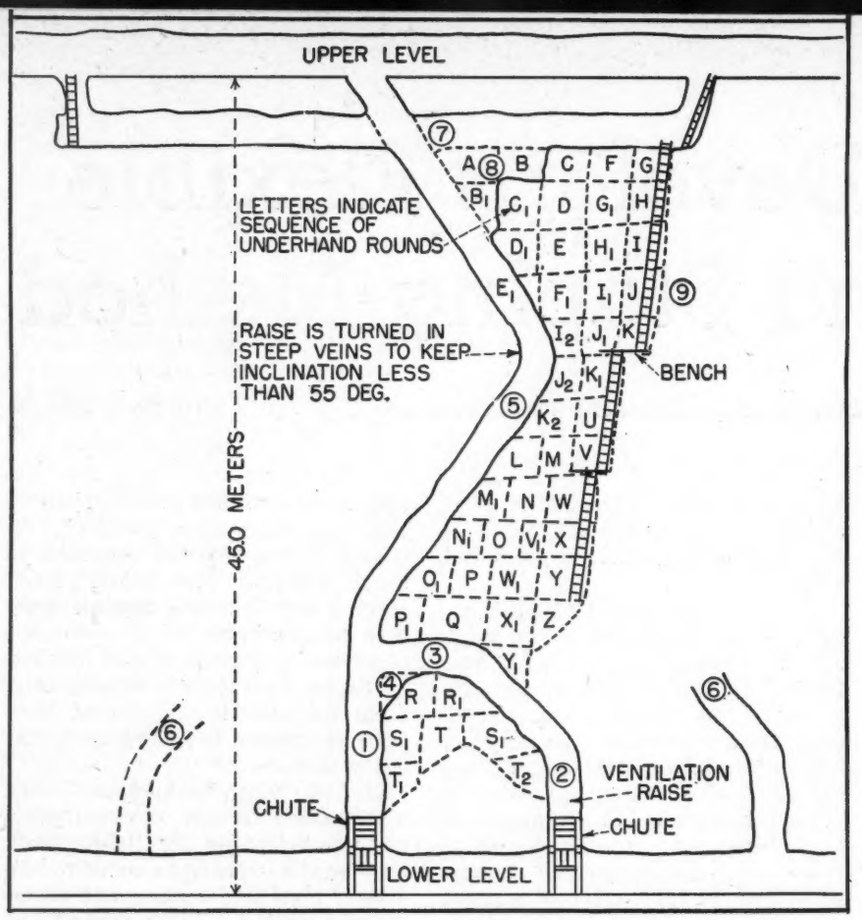
Discovery of the Fresnillo deposit by the Spaniards was in 1555, and the first extensive mining was from 1751 to 1757. Thereafter the property was mined intermittently until 1903, when The Fresnillo Co. first entered the district. Following the successful leaching of old tailings piles, Proaño hill was acquired, and a 500-ton cyanide plant built to treat ore from dumps and shallow workings. In 1920, after all exposed outcrops and accessible mine openings had been sampled, it was estimated that ore reserves totaled approximately 5,000,000 metric tons of minable oxide ore that averages more than 200 grams of silver.

Because of the low grade of ore, the glory-hole method was used to mine down to the 105-m. level. Here the stockwork deposit split into definite veins, which were oxidized and had been in part worked by earlier operators. Consequently, from the 105- to the 165-m. level both shrinkage and top-slice methods were used.

In 1925 when development work was pushed to the west, sulphide ore was found on the 105-m. level. Two shafts were then sunk to the 425-m. level and subsequent development proved a large tonnage of ore with strong walls. The mining method was changed to underhand open stoping. Because of the similarity between this method and the

FRESNILLO'S NARROW VEINS are amenable to underhand stoping.





Underhand Method

Underhand stoping as shown in the accompanying illustration usually proceeds as follows:

1. The main raise is driven 12 m. above the level and slabbed for a chute.

2. While timbermen are building the chute, another raise 10 m. high is driven 15 m. to one side for ventilation.

3. A connecting drift is driven to the main raise. If the chute is finished first, the drift is driven from the main raise; otherwise it is driven from the second raise.

4. The floor is slabbed down to prevent the ventilation drift from filling with muck.

5. The manway and pipe lines are installed in the ventilation raise, and the main raise is driven through to the next level. If the vein dips more than 55 deg., the raise is turned to the right or left to maintain a maximum 55-deg. inclination. A steeper raw raise is hazardous.

6. After the main raise has been connected, other raises are driven on both sides to a height of 10 or 12 m. Spacing is governed by dip of the vein. For vertical veins the interval is 15 m., and for flat veins, 10 m.

7. Where the main raise connects with the upper level, preparation drifts, 1.8 m. high, are driven on both sides for a distance of 15 m. or more, and connected to the level above. Pipe lines and manways are put through these connections. Stope preparation is now complete, and bench mining starts.

8. In the underhand method employed, two benches approximately 2½-m. long are drilled and blasted each shift. The upper bench is mucked clean as shown at B, and work is started with one jackhammer. The lower bench B_1 is cleaned and a second machine is put to work. The same system applies to all normal cycle rounds such as C, C_1; D, D_1; etc.

9. Stope manways on vertical veins are carried at the end of the stope. A short bench is left every 10 m., and a stull and two laggings are installed to form a platform. Machines, hoses, and steel rest on these during blasting.

In inclined veins manways are put on the footwall. Where the stope is more than 8 ft. wide, holes are drilled in the footwall, pieces of discarded mill rods are wedged in them, and a platform is built on these rods. In these wider stopes it is safer to leave a small bench as in the vertical veins.

10. Pipe lines are carried on one side of the manways and are tied to the stulls or mill steels. Drip line-oilers are installed at the top of all stope air lines.

glory-hole method, labor trained in the glory-hole method could easily be adapted to the new method.

During the development of the western part of the mine, several important sulphide veins were discovered.

The mine is served by three surface shafts; one handles both skips and cages and has been sunk to the 730-m. level; one hoists only ore from the 470- to 590-m. level; and the third is for ventilation and man cages to the 695-m. level. A vertical interior shaft with skips and cages connects the 695- and 965-m. levels, and an incline shaft equipped with skips and cages hoists from the 830-m. level to the 695-m. level. Several other underground service shafts and winzes operate with cages only.

In the upper section of the mine, a level interval of 35 m. was first used, but this interval was increased to 45 m. below the 425-m. level. Haulage levels are spaced 35-m. apart.

It has been found advantageous to combine overhanding with underhanding in some stopes. Here the block just above a level is overhanded for 5 or 10 m. above track. A timbered floor is hitched in 3 or 4 m. above track, and chutes are installed. When the underhand cut comes down into overhand area, ventilation is much improved, but the cost of maintaining these floors exceeds the value of the ore removed. However, if the walls are known to be weak and long maintenance will not be necessary, this is the safest way to extract the back pillars.

At present an overhand flat-back shrinkage stope is being tried. It is being mined from a raise which has been driven at one end of the stope. A stulled ore pass is carried up next to this raise, and broken ore is pulled into the ore pass by a two-drum tugger hoist.

Three types of dynamite are used in the mine: 40% gelatin as a primer for the 40% ammonia gelatin in all drill-hole blasting, and a 30% gelatin, used for chute blasting.

Formerly, 1 in. x 1 in. x 6-in. wooden spacers were used in the stopes to distribute the powder in the holes. This reduced the powder cost, and although these spacers were not authorized for development contractors, some of them obtained the spacers and used them in confined workings. The high amount of carbon monoxide formed was very dangerous, and their use was discontinued throughout the mine. As a substitute 1 in. x 1 in. x 6-in. burnt-clay spacers have been in use for the past two years. As the clay is inert, no gas is formed

by the spacers. In leading holes the primer cartridge is placed in the bottom of the hole with the primer pointed downward.

Water sprays are used and ventilation pipe and Ventube supply adequate ventilation to all hot, isolated workings. If places are dry, and the dust count is excessive, calcium chloride is sprayed on the walls regularly. Change rooms are equipped with aluminum-dust disseminators. Men showing excessive amounts of silicosis on X-ray examination are given a course of inhalator treatments with the aluminum ball-mill equipment at the company hospital, in addition to change-room exposure.

Inspectors in charge of blasting visit each working place each shift. During the shift they advise the "cabos" (shift boss) of any dangerous places, and turn in to the safety department a written report of all unsafe conditions encountered. These findings are compiled into a single report and sent to all supervisors the following day, to be used as a check. If reported hazardous conditions are not remedied, the safety bonus paid the "cabos" is reduced. This bonus system allows all supervisors to make 12% of their wages or salary. Lost-time accidents reduce this according to the severity of the accident.

Winzes

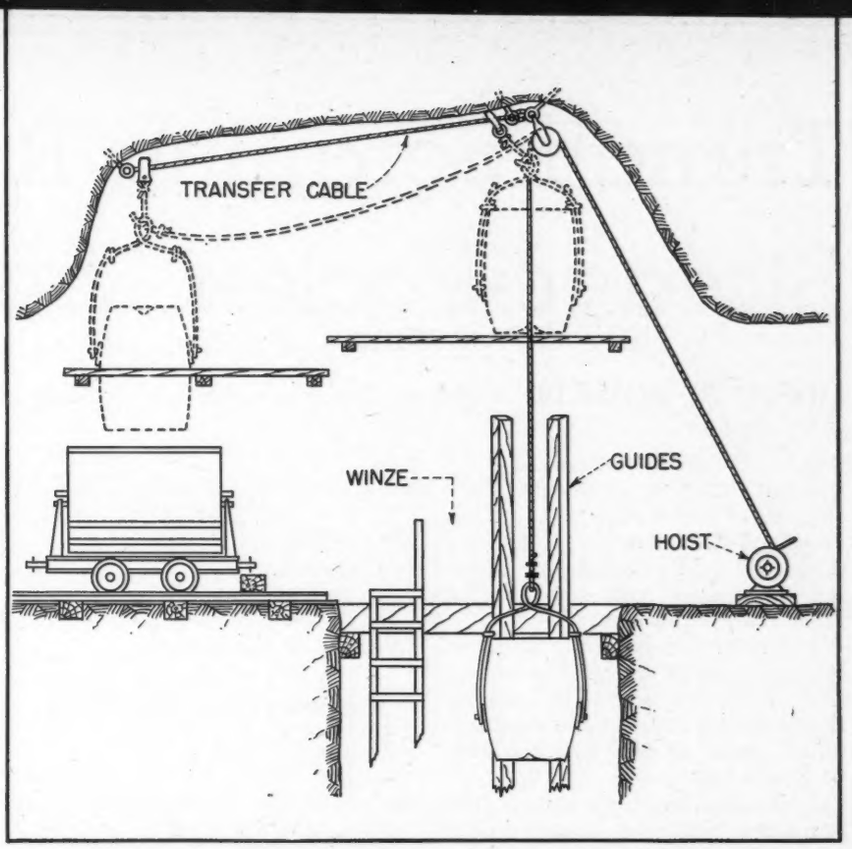
Winzes are used to develop the orebody and speed raise connections when necessary. Development winzes are usually 1.65x2.85m., which allows plenty of room for guides, manway, and ventilation pipe or Ventube.

Nine-cubic-feet buckets are usually used. These may be self-dumping for use with a small pocket, or of the hand-dumping type as shown.

Formerly, all winzes or shafts were sunk with jackhammers, but during the last two years it has been found more advantageous to use two drifters set up on a 2.15-m. arm mounted on a 1.25-m. column.

After a period of years it has generally been found necessary to fill parts of mined-out sections with waste, normally obtained from crosscuts and other development headings. However, certain parts of the mine which are not near development workings are filled more economically with waste which has been broken in a surface glory hole and passed to the old stopes.

Other operating practices and costs of interest are as follows:



MUCK FROM WINZE ROUNDS is hoisted to a short transfer cable on which it is conveyed to a dumping platform above ore cars.

Diamond Drilling. As there are many branch and parallel veins, routine exploratory diamond drilling has proved very fruitful—several important orebodies were so discovered. Types of machines used are: Sullivan Model 22 and 10 electric types, Model 6 air type, Longyear U. G. air type, and Chicago Pneumatic Model 5 air type. The average hole is 400 to 500 ft. Diamond drilling averages 2,500 ft. per month, and the cost per foot drilled, including moving, setting up, and new equipment, amounts to $1.21.

Mucking Machine Maintenance. Eighteen G. D. mechanical loaders are in use. As mine labor in general is not mechanically minded, it has been necessary to assign a mechanic and helper to take charge of nine shovels. The mechanics grease and oil the shovels twice a week, and make minor repairs. Complete overhauls are made in the surface shop.

Bonding Rails. Rails of the trolley tracks on haulage levels are bonded. To increase efficiency of the system, old hoisting cable has been laid parallel to the track and bonded at regular intervals.

Hard Insert Bits. Some tests have been made with Sandviken's "Coromant" hard insert bits. Drilling time has been reduced and a great many feet may be drilled without resharpening. Tests thus far do not indicate that these bits are more economical than detachable bits.

Bit and Steel Costs. Timken Type M detachable bits are used exclusively. The drill shop handles about 7,250 bits and repairs 200 pieces of steel per day. Consumption of steel is approximately 7.5 tons per month— 90% is 1⅛ in. and 10% is 1 in., and both sizes are round, lugged steel.

The total number of new bits used during the last fiscal year was 215,000; bit uses during the same period amounted to 2,178,000 at a cost of $0.0408 per bit use. The number of bit uses per ton was 3.386 which includes development, preparation, and mining at a bit cost of $0.138 per ton. The rod cost per ton was $0.061 including cost of new steel and threading. (All costs are U. S. currency.)

Underhand stoping in narrow veins can be done economically and safely if the walls and ore are structurally strong. If slips or fractures are parallel to the vein, this system may create a hazardous working place. However, if they are normal to the vein, the ore may be extracted safely.

I wish to thank J. H. Ashley, general manager of The Fresnillo Co., for permission to write this article.

Trench Scraping Replaces Storage-Pocket Loading

GRANT T. HOLLETT, Engineer, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

TRENCH SCRAPING at several shaft stations of the Mather mine of the Cleveland-Cliffs Iron Co., Negaunee, Mich., has demonstrated the following advantages over skip loading from storage pockets:

1. Ore in storage in the trenches is always visible to the skip tender.
2. If the ore is wet, the sloping trench allows excess water to drain off to end of trench, where it may be pumped out.
3. If wet and dry ores are encountered, they may be mixed during scraping to permit easier handling.
4. With the storage system, two men are required, one at the station elevation and the other at the measuring pocket below. The trench pocket system requires only one man, who scrapes dirt into the measuring pocket and loads the skip as well.
5. The scraper fills a measuring pocket which has the same capacity as the 6-ton skip, thereby eliminating spillage during skip loading.
6. The installation eliminates the necessity of excavating large rock volumes near the shaft which are usually needed for storage pockets.
7. Five or six Granby-type cars can be dumped at one point in a few seconds.
8. Several grades of ore can be handled independently by using two trenches as illustrated.

Standby Unit Provided

Essential features of the fifth level plat at the Mather mine are shown in the accompanying illustration, and steps in its construction are explained in the caption.

The scraper hoists commonly used are 40-hp., 1,700 rpm., a.c. units. A 25-hp., 1,700-rpm., a.c. hoist can be used as a spare or standby unit. When ore is dumped into the trench, three or four passes of the 60-in. scraper are required to fill one pocket. Two loaded 6-ton cars may also be dumped directly into each pocket to fill them.

The camel-back dumper for the Granby-type cars is shifted by attaching a chain and pulling the dumper to a new position with the motor.

Throughout the shift, muck is scraped into the measuring pocket from the trench by the skip tender. He sees that the skip is spotted properly, and operates the air cylinder which opens the chute door to the skip. He signals the hoist engineer when the skip is loaded, and designates the grade of ore or rock in the skip by a bell system. This man also breaks occasional chunks that fall on the grizzly, and blows out the pocket when ore tends to pack.

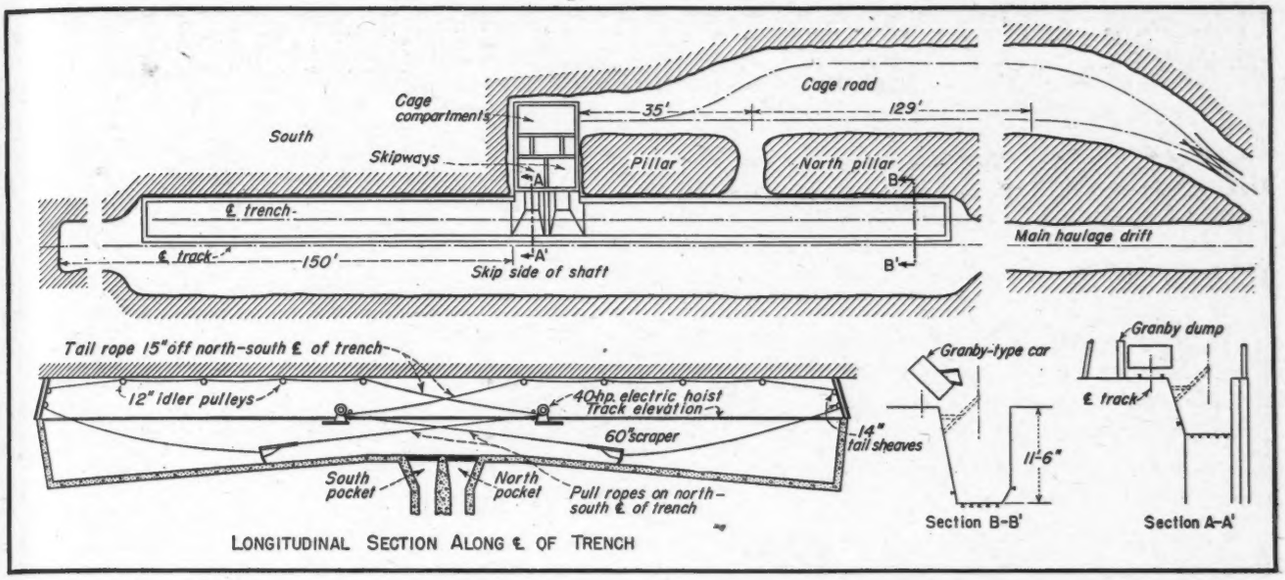
Although scraping is in effect one extra handling of ore over direct dumping into storage pockets, the advantages of the method listed previously greatly offset this disadvantage.

Furthermore, the trench scraping system permits the positive control of the ore or waste dumped into the measuring pocket. The pocket is filled flush with the grizzly, and this eliminates skip spillage in the shaft.

The helpful comments of F. J. Haller, superintendent of the Mather mine, and assistance in presenting this information are gratefully acknowledged.

MUCK IS DUMPED from Granby-type cars into trench and scraped into measuring pockets feeding into skip compartment of shaft. The camel-back dumper may be shifted.

ONLY ONE MAN is required to load skips. He scrapes ore into measuring pocket, loads skip, signals hoistman, and breaks occasional chunks of ore remaining on the grizzly.



HOW THE FIFTH LEVEL PLAT WAS DEVELOPED

1. A small drift was driven approximately 35 ft. north from the cage compartment, then 20 ft. east and 35 ft. south to connect with the skip side of the shaft.

2. A temporary pocket was installed to handle broken waste.

3. Permanent pockets were excavated and concreted. Pocket doors, cylinders, and grizzlies were installed.

4. Scraper hoists were installed on the south side of the permanent pockets.

5. A 10x10-ft. drift, 90 ft. long, was driven north of the trench elevation, which is approximately 7 ft. below the main haulage drift elevation.

6. The scraper hoist was turned around, and a south trench was driven as shown.

7. Five 60-lb. rails were placed in the trench forms about 12 in. from the bottom. They were laid at a very slight angle to the center line to prevent wearing of the scraper blade at any one point as it is drawn down the trench.

8. A 12-in. concrete floor was poured, and forms for the walls were started.

9. Two rails were installed in the walls to act as buffers, or wearing surfaces for the sides of the scraper.

10. The fillet on the west side of the trench allows the top of the scraper to clear the concrete walls.

11. To complete the east side of the plat, the back was stripped 9 ft. above top of the trench, and the rib east of the trench was sliced wide enough to place steel sets in the main haulage drift.

Shatter Cut Efficient at a Mexican Mine

FOR YEARS San Francisco Mines of Mexico, at San Francisco del Oro, Chih., has used to advantage the shatter-cut round here described, according to A. B. O'Neel, general mine superintendent. The burn cut consists of four to seven parallel holes, according to the type of ground, surrounding a central hole. Of these only the center hole is loaded, it being blasted with as much 40% powder as can be tamped into it. Care should be taken, according to Mr. O'Neel, that only about 2 in. of rock, or the least amount that will sustain itself, is left between the wall of the center hole and the other burn holes. The four relievers drilled around the burn cut should be closer to it than the average burden that is left on a hole.

Advantages claimed for this cut are: (1) Depth of round is limited only by the time cycle allowed for drilling; (2) less powder per unit is consumed; (3) the certainty with which the round pulls to bottom; and (4) the ease of pointing the holes.

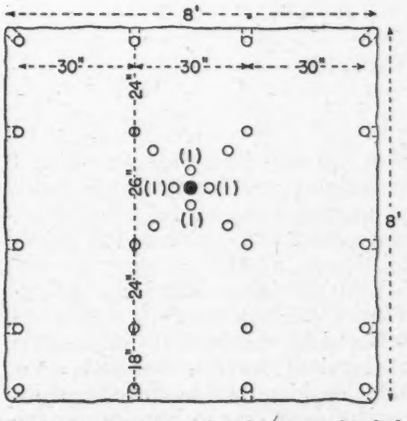
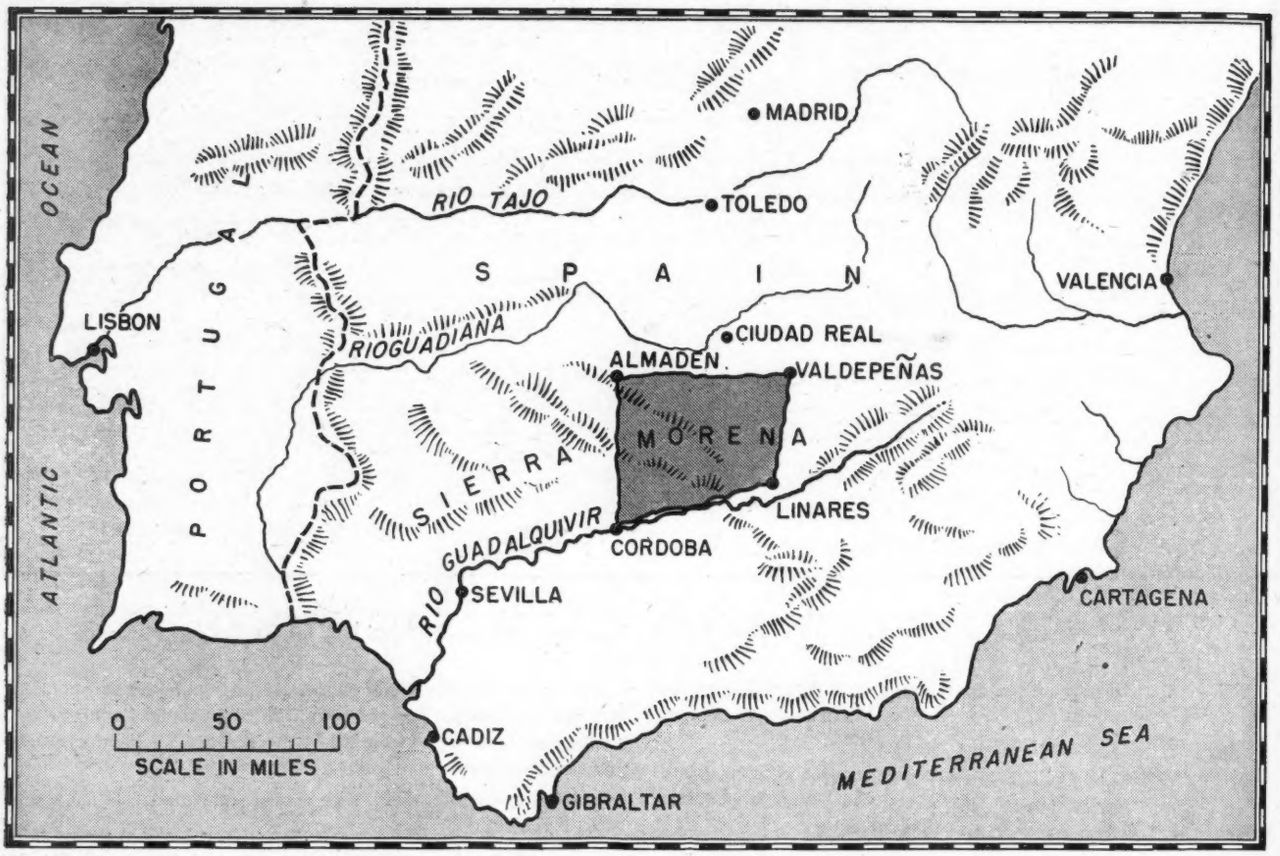


Diagram of round. (1) indicates unloaded burn-cut holes.

Using this burn cut, a simple efficient round was developed for use with a 3-drill Cleveland MDR-3 jumbo in an 8x8-ft. heading. Each side machine drills two vertical rows of five holes each, one row close to the corresponding rib and the other 30 in. away from the first row toward the center. The two center rows will thus be 30 in. apart also. In each vertical row, the top hole is 2 in. below the back and the second, third, fourth, and fifth (or bottom) holes are respectively 24 in., 26 in., 24 in., and 18 in. apart.

The center machine of the jumbo drills the cut holes and the relievers, which can be shifted to any part of the face where the ground is more even and suited to this type of cut.



RICH LEAD DEPOSITS in the shaded area north of the Guadalquivir River have been mined off and on for more than 2,000 years, but none of these operations has gone much below ground-water level, although lead ore continues on down.

Modern Methods Could Thaw These Frozen Lead Reserves

FRANK W. CANNADAY, Denver, Colo.

THE RATE at which known reserves of lead ore are diminishing throughout the world makes the future of lead of increasing interest to the mining industry. Any mining district that offers some hope of new lead production is receiving, or should be given, intensive study.

Such a district is the Sierra Morena region, in Spain, and in particular the Linares and Carolina districts, in the center of the Sierra Morena. These cover a rough parallelogram based on the Guadalquivir River, with corners near Linares, Cordoba, Almaden, and Valdepeñas. Here men have mined lead and mercury since early Roman times, yet for reasons which I shall point out, this 2,000-odd years of mining has not fully exploited, nor even fully explored, the possibilities of the area.

Lead mining in the Linares-Carolina district up to the present has suffered from lack of the large-scale modernized mining methods that alone could surmount the difficulties encountered there. Heretofore, the "line-of-least-resistance" methods used have burrowed out numerous shafts and a multitude of workings down to a depth of 200 to 400 meters, where ground water brought mining up short. Problems of pumping or ownership have stopped activity rather than discontinuity of veins.

For example, in the lowest level of one of these mines (800 meters) in 1926, I dug *chinas* of galena weighing several pounds from the floor at the time the mine was being closed down because of the pumping problem. A parallel vein here had never been worked, because of separate ownership, even though a 200-meter drift could have opened this new vein 2,500 ft. below the surface.

The Linares district is marked by a granitic island about 10 km. long and 5 kw. wide surrounded by shales and slates. Lead veins in the granite, vertical or dipping up to 75 deg., also project into the sedimentaries, apparently without loss of mineralization or continuity. Ten

km. north, the structure is repeated, where a second granite batholith has given rise to the Carolina district. These areas are covered by hundreds of concessions, 500 meters long on the vein by 200 wide, owned by highly individualistic men who lacked, however, the capital or the knowledge for effective mining at depth or on a large scale.

For large-scale exploration at depth, Linares offers, probably, the best immediate mining opportunity in Spain. Ore is proven to all depths explored, and it is clean and mineralization is not complex. Transportation is easy and adequate, and labor supply is abundant and competent. The climate is mild and healthful. The countryside is cultivated intensively; hence cost of living is low. Electric power is available, and two smelters lie within 5 km. of any of the mines.

A proper scheme for development here would involve working much of the district as a unit and concentrating the ore in one large central mill that would replace the extensive hand-jig operations now in use there. In such a way could this "exhausted" district be revitalized.

Water No Problem

Although mining has largely halted through inability to handle pumping costs, the fact is that 275 g.p.m. is considered "a lot of water" in this district. Many mines, abandoned because of water, did not encounter a fifth of that flow. The fact is that bails of their Cornish pumps were drowned out by any but the smallest of flows. A solution might be to run about 10,000 meters of traverse at a suitable depth through the district, both to explore further and to provide for central drainage. A substantial (about 60%) cut in mining costs would be taken right there.

At any rate, the quantity of water to be met here is no problem for modern equipment. Simple methods would suffice to gain access to the zone between about 400 meters, where most mines stopped, and 800 meters bottom (in ore) of the district's deepest mine. This mineralized zone, 400 meters in thickness, covers an area of about 25,000 acres. Available data, of course, take no account of whatever may lie below the 800-meter level.

In general, the deepest mines are collared on the highest ground, where static water was farther from the surface. In lower ground, water was met at shallow depth, and in most such mines no work at all has been done in this century.

The chief obstacles to successful operation in the Linares district are the smallness of the individual holdings and the vagaries of human nature, which prevent consolidation of effort. Only with patience, good humor, and infinite tact can these obstacles profitably be overcome.

The first step in uniting the many small segments of the district would, of course, be to approach the individual owners directly with a plan for cooperation. Because each such individual would probably insist on putting the central shaft on his own property, this first effort would be fruitless. Then recourse to the national Government should be taken, the approach being made under terms of a "national interest" decree of 1940 that provides that leaseholders may be given only a limited term in which to get their claims into production before their rights become subject to national disposition. Unless the Government has changed its ideas recently, a proper approach will receive sympathetic and interested consideration.

In other words, outright purchase or lease of the entire district not appearing feasible, a potential exploiter interested in working the area as a whole, as indeed it must be worked, should count on amalgamation of the many owner-interests at Government suggestion under the national interest clause. Operation under such a corporate, Government-sponsored body would be greatly simplified.

All but about 8,000 acres of the 25,000 acres mentioned could be handled in this way. The doubtful 8,000 lie on the eastern, and most exploited, side of the area, and are controlled by two mining and smelting companies that might or might not be amenable to amalgamation. Their decisions, however, would hinder in no way the district plan.

It is also possible to begin in a smaller way by developing a block of about 5,000 acres that is not now in exploitation or strongly held. This would serve as a base for exploration and a source of experience.

In considering any such undertaking, one should bear in mind the possibilities of the superficially explored non-ferrous metal area of the whole Sierra Morena and its adjacent mountain ranges and table lands. Almost assuredly, competent modernized investigation will uncover hitherto unknown orebodies.

In view of the 400-year-old Spanish practice of industriously high-grading their holdings in the New World, it is not unreasonable to think that much of substance in their own country may have been dropped to grasp at shadows elsewhere. Certainly no one here, where the surface has been so rich, has made trial of the deeper horizons.

Is Spain's Present Government Firm Enough to Justify Investments Such as Suggested in This Article?

Opinions on the permanency and respectability of the Franco Government in Spain differ widely and often passionately. Mr. Cannaday's opinion, which should not be confused with the opinions of *E.&M.J.'s* editors, is as follows:

"The present transient, benevolent, military dictatorship is the natural result of civil, not sectional, war, and it is probably the only practicable government for this interim period. Were I a prospective investor, I would give Spain no consideration were there prospects of domination by the present known communist pressure groups. However, it is to be doubted if their insistence should rate higher than its nuisance value.

"The majority of the Spanish people recognize the shortcomings of their interim government, and in time, and as new leaders are developed from their younger citizens, a new and more satisfactory government will materialize. In the meantime, they prefer what they have to a foreign-imposed government crammed down their throats, and they will defend it accordingly."

Drifters Sink Hecla Shaft From Pneumatic Jumbo

JOHN B. HUTTL, Associate Editor

Here is the first published description of a jumbo designed for shaft-sinking work. Its use in the Hecla shaft has cut drilling time 10%.

WHAT IS PERHAPS one of the first drill jumbos designed for shaft-sinking work is in successful operation in the Hecla shaft at Burke, Idaho, now being sunk to a new horizon by the Hecla Mining Co. The principal objective the designer, R. W. Neyman, superintendent, aimed to achieve in evolving the jumbo to be described was to eliminate the time-consuming transportation to and setting up at the bottom of the shaft of drill equipment and auxiliaries and their subsequent removal after drilling the round required in conventional shaft-sinking practice. In this, Mr. Neyman has been quite successful, as months of work with the jumbo have proved.

Design and construction of the jumbo are illustrated in a self-explanatory manner in the accompanying line drawings. Specifically, they show the assembled upper part of the jumbo, the lower part (pivotal column) and connection to the upper guide carriage, and details of the air-cushioned points constituting the bottom ends of the columns designed to balance the columns on uneven ground.

The upper part of the jumbo has an inner inclosure resembling a tank, within which the water and air supply hoses coil as the jumbo is raised in the shaft following the completion of drilling. The hoses remain fixed to the supply lines at all times, and connect to the column pipes from *C* to *D* as shown in the halftone.

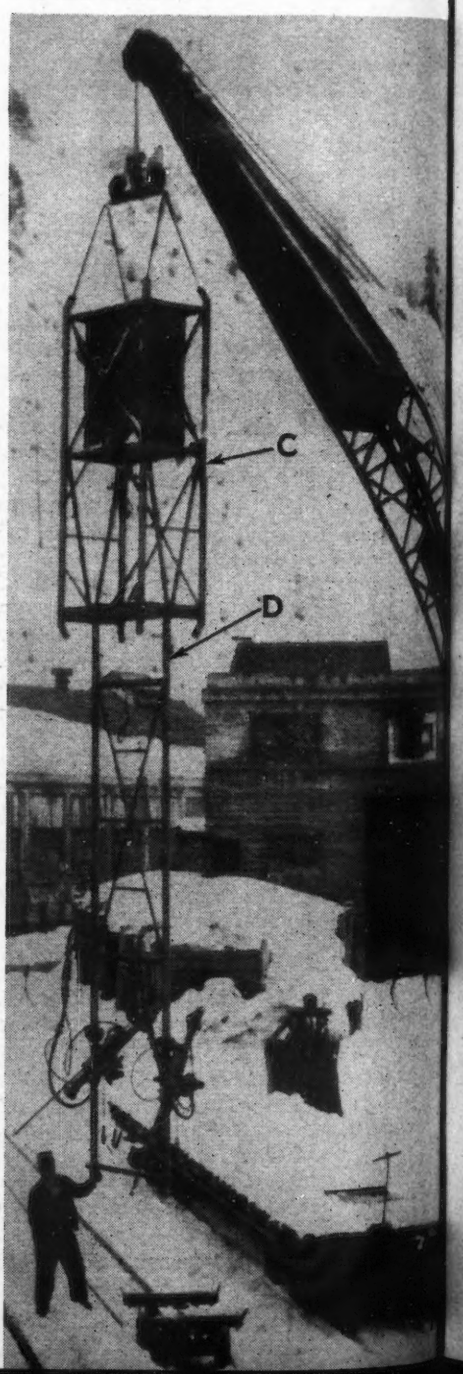
The tops of the pipe columns *B* are pivoted at *A* (see detail *A*, line drawings), so they can be swung to the desired position longitudinally in the shaft when preparing the drill set-up. The vertical columns *B* form the air manifold, supplying air to the drills proper, blowpipe, and sump pump. The cross bracing is interconnected to form the water manifold. Air passes from the columns through hoses to the drills, and water is obtained from the manifold. The air pressure in columns *B* also actuates the pistons in the bottom ends of the columns, automatically equalizing the weight on each column when they rest on a sloping or an irregular bottom. A horizontal member keeps the columns from spreading out of parallel. Recently, a bar has been attached rigidly between the two columns at a point just below the arms holding the drills. A third drill is now used on this bar, permitting simultaneous operation of three drifters.

Drifters on bars in drilling position are shown in the accompanying halftone. After the round has been drilled, the outside drifters are swung around the columns *B* toward the center until their position is about parallel with the columns, and the complete jumbo is hoisted from the shaft floor by a tugger hoist installed at some convenient point above the operation. The hoist cable is attached to, and run through, pulleys *E* to give greater lift at a slower speed when moving the jumbo. It is not necessary to turn off the air or water from the supply lines, nor need any hoses be disconnected.

Referring to view *A-A*, it will be noted that this section of the framework provides a platform for mounting a tugger hoist. The tugger hoists used are I-R Type E-U, with a 2,000-lb. rope pull. They are used to hoist the mucking pan during mucking operations, to lower and raise the steel blasting set, and to lift the timbered set up against the set installed previously. The tugger hoist cable hangs vertically through the 3x6-in. hole in the platform and close to the divider supporting the guide in the working compartment (center compartment in the three-compartment Hecla shaft). One jumbo unit hangs on each side of the working compartment with the hoist toward it.

The jumbo has been in operation for several months, and has resulted in a 10% reduction in drilling time.

ASSEMBLED JUMBO with drifters in place. Water and air hoses attached permanently to supply lines connect to the column pipes at points *C* and *D*.



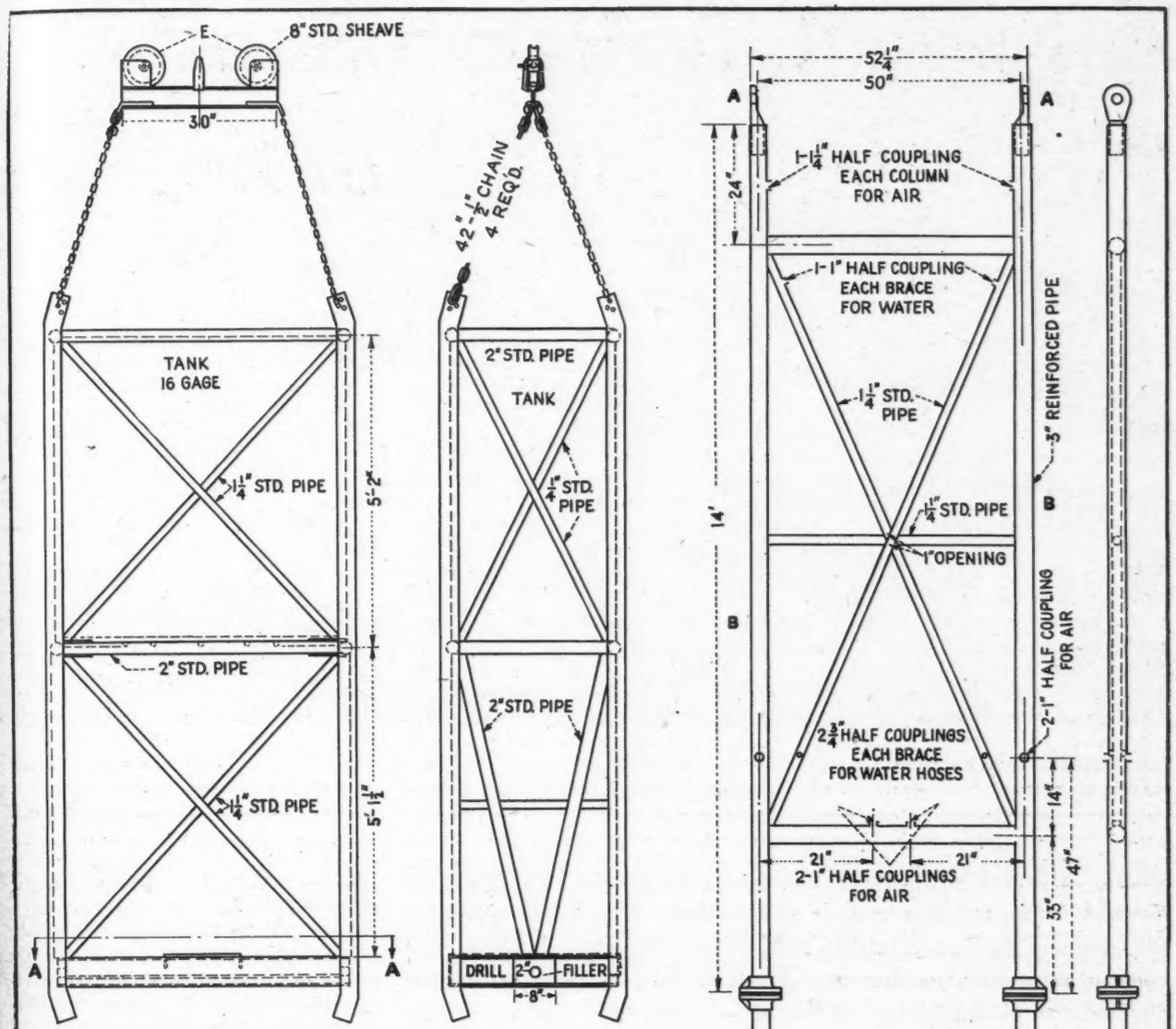
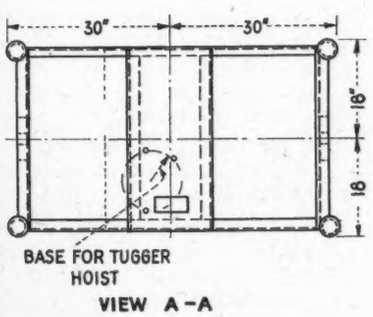


FIG. 1. Upper section of jumbo with built-in oval tank

FIG. 2. Pivotal column section of jumbo



VIEW A-A

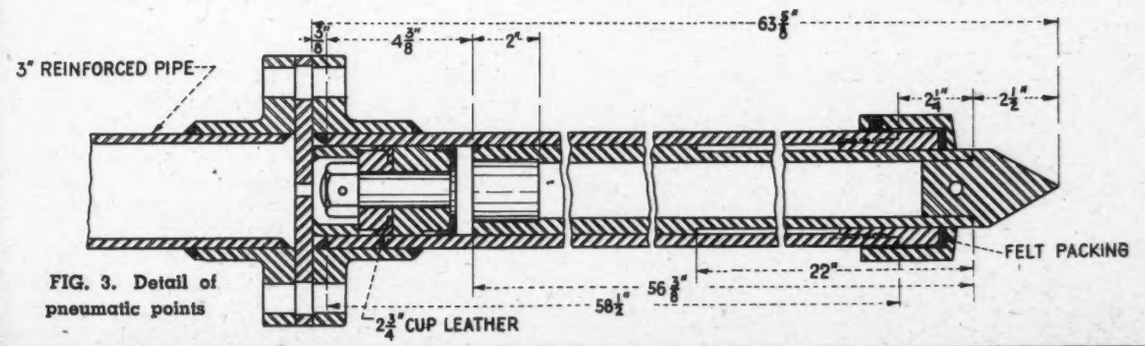
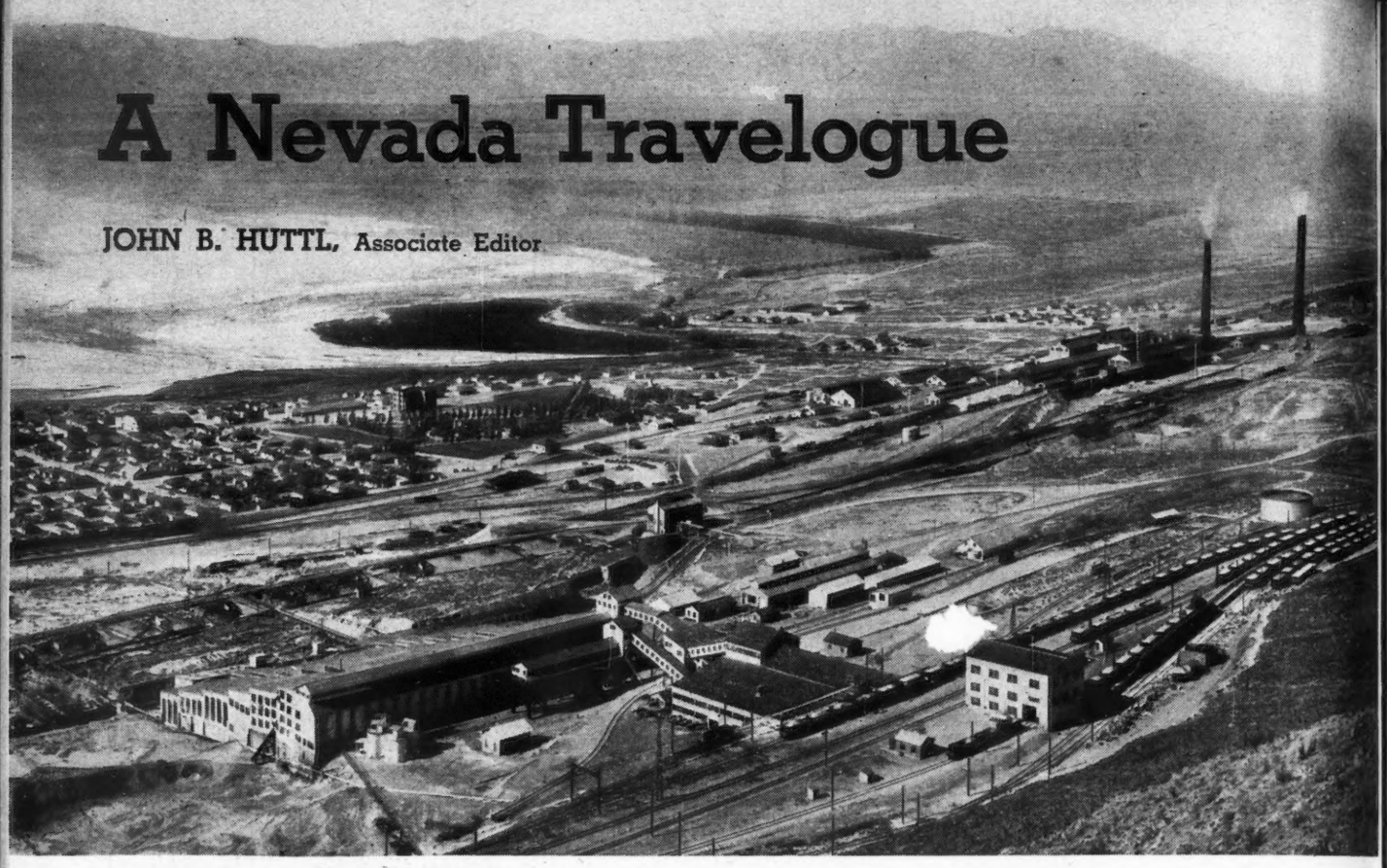


FIG. 3. Detail of pneumatic points

A Nevada Travelogue

JOHN B. HUTTL, Associate Editor



CONCENTRATOR of Kennecott Copper Corporation at McGill handles ore shipped from Liberty pit and Consolidated Coppermines Corporation, at rate of 17,000 to 18,000 tons a day. Second reverberatory furnace is under construction at the smelter.

Mining activities are slowly expanding in central and northern Nevada. Labor remains number one problem. A shortage of miners still plagues the more remote properties, although conditions are better at mines near centers of population. Current efforts are being directed toward improving operating practices and working conditions, and in doing development work neglected during the war. Higher metal prices should prove a further incentive.

ON RETURNING to San Francisco recently from a field trip through some of the major Nevada mining districts and looking over the great amount of data accumulated, I believe that a concise report of the position and prospect of the many mining enterprises visited will be of interest to the reader. Traveling first east by car along U. S. Highway 40 as far as Palisade, Nev., then turning south with Pioche as the end point, and finally returning to San Francisco via U. S. Highway 50, the trip constituted a circle tour of central and northern Nevada. During the journey the following properties were visited: Standard Cyaniding Co., near Lovelock; Nevada-Massachusetts Co., Mill City; Getchell Mine, Inc., near Redhouse; Riley tungsten mine of U. S. Vanadium Corporation adjoining the Getchell mine; Copper Canyon Mining Co., near Battle Mountain; Natomas Co., Greenan placer enterprise near the Copper Canyon property; Callahan Zinc-Lead Co. at Mt. Hope; Eureka Corporation, Ltd., Eureka; Kennecott Copper Corporation at McGill and Ruth; Consolidated Coppermines Corporation, Kimberly; Combined Metals Reduction Co., and the Comstock Lode.

Gold-mining operations were resumed after three years of wartime shutdown at the Standard mine, operated by Standard Cyaniding Co. and situated 25 miles northeast of Lovelock, on Sept. 16, 1946. The property and mining and milling practices were described in detail by H. L. Hazen, president, and Henry Bradley, vice president, in the August 1945 issue of *Engineering and Mining Journal.*

Current operations differ little from those practiced before the shutdown brought about in 1942 by enactment of L-208. It goes without saying that considerable study and planning preceded actual reopening of the mine to assure success at present high costs for labor and materials. Despite the increase in wages and the higher cost of some supplies, current operating costs are almost those prevailing before the shutdown. Mr. Hazen attributes this efficiency to the following factors: (1) An experienced contractor is handling the mining; (2) installation of larger crushing and conveying equipment in the crushing plant; and (3) reduction of the working force in the mill and office from the former 27 men to 19, including manager and cook.

The open-pit work is conducted under contract by A. J. Kirkman, of Mercur, Utah, who by use of larger trucks (10-yd. Macks) and personal management of operations, has been able to maintain former mining and haulage costs. Drilling is done with wagon drills, and careful loading of holes, locally termed "barrel loading," has eliminated much of the

secondary blasting formerly done. The contractor, depending on the character of the ground, uses two different methods of barrel loading. In blocky ground, the 3-in. wagon-drill holes, spaced at about 9 ft., are drilled to a depth of 18 ft., filled with powder up to within ft. of the surface, tamped, and detonated simultaneously with a blasting line from the 440-volt power circuit.

In normal ground, the holes are drilled to a depth of 18 ft., and the bottoms subsequently sprung. Spacing is 12 ft. These holes, too, are loaded with powder up to within 4 ft. of the surface, tamped, and blasted simultaneously with the 440-volt blasting circuit. Mr. Kirkman broke some 150,000 tons of rock last fall with a powder consumption of slightly less than ¼ lb. per ton. The material mined weighs 2.07 tons per bank yard, making powder consumption per bank yard less than ½ lb. About 500 yd. of ore and 700 yd. of waste are moved a day, and the operating crew consists of 13 men.

New Crusher Unit

The mill flowsheet follows closely that given in the article mentioned previously. The crushing plant now contains a 30x36-in. primary crusher, a 4x10-ft. Jeffrey vibrating feeder in place of the old Ross feeder, and wider conveyor belts. Crushed ore is reduced in a rod mill, with the sands leached and the slimes thickened, then filtered and washed on drum-type filters. The gold is precipitated with zinc dust, melted into bullion, and shipped to the U. S. Mint in San Francisco. Charles L. Hazen is in charge of the mill, as well as of labor relations. Labor turnover since reopening of the property has been low, and efficiency is good.

On Jan. 1, 1947, the company put into effect a bonus system that has worked satisfactory in enhancing the interest of the men in the job and increasing over-all efficiency. Explained briefly, the management increases the hourly wage of each employee by 1c. for each full 100 tons by which the ore milled each half month exceeds 8,250 tons. Under this system labor costs amount to 31c. per ton when 8,250 tons are millel, and 22c. per ton for all ore in excess of 8,250 tons each half month. Owing to inclement weather, tonnage mined recently dropped to 500 tons per day. Immediately after posting the bonus notice the daily tonnage went back to 600 tons.

Nevada - Massachusetts Co.'s tungsten mine, near Mill City, is currently producing about 400 tons of ore a day. The Golconda and Toulon units remain closed. Practically no changes have been made in mining and milling practices since my visit last year, which were described in detail in the July 1945 issue of *E.&M.J.*

About 20 percent of the daily production is obtained from open-pit operations, and the rest from underground workings in the different mine units. The company has opened a new mine a short distance from current producers, the O'Byrne prospect, and recent development has disclosed a fair tonnage of good ore. Mechanization of underground work continues, with mechanical loaders playing an ever-increasing part in the preparation and mining of blocked-out ore. Milling practice follows closely that described in the article mentioned. A full crew is now at work for the first time in several years. W. G. Emminger, general superintendent, directs operations, Eldridge Nash is mine superintendent, and P. McGuire is in charge of the mill.

The Getchell gold mine, about 26 miles northeast of Golconda, remains inactive, so far as actual production is concerned. Work now in progress is centered in carrying out metallurgical test work and improving plant installations. A crew of 35 men is employed. At the mine a large tonnage of good ore is available for milling, and a new vertical shaft has been sunk to a depth of 300 ft., with drifting in progress to connect it with other underground workings. Shaft equipment installed recently includes a new steel headframe and hoist.

Mill Test Work

Periodic pilot-plant tests are made to investigate the possibility of floating off arsenic contained in the ore, eliminated by roasting before the shutdown, to improve metallurgy in general, and on the Chapman charcoal process of gold recovery. At the crushing plant a 36x42-in. jaw crusher, 4-ft. Traylor TY gyratory crusher, two Symons rod-deck screens, and larger conveyor belt equipment are being installed. This and other changes to be made in the mill will permit handling of from 1,200 to 1,500 tons of ore a day when operations are resumed. Frank J. DeMel, superintendent, is in charge of operations.

The Riley tungsten mine, acquired some time ago by the U. S. Vanadium Corporation, ceased production soon after my visit. It is about two miles distant from the Getchell property and is equipped with a 150-ton concentrator. Present activities are centered in exploration and development work. George Peters is superintendent.

Some 18 miles south of Battle Mountain are the mine and 350-ton flotation plant of the Copper Canyon Mining Co., with Robert H.

THIS 350-TON FLOTATION PLANT of Copper Canyon Mining Co. near Battle Mountain produces copper-gold concentrates. Julie shaft, at left, is being deepened to develop Hornfels orebody delineated by previous diamond drilling.

Raring, general manager, in charge of operations. This property was worked under lease and option during the war years by the International Smelting & Refining Co., Anaconda subsidiary, Copper Canyon Mining Co., the original owners, taking over more than a year ago. Daily production averages about 300 tons. The ore contains both copper and gold values, and a bulk concentrate is made for shipment to the Garfield smelter of A.S.&R. High-grade ore encountered occasionally and the hutch product of the Denver jigs operating between the ball mills and classifiers are shipped separately. Comprehensive research work on material containing oxidized copper minerals is in progress.

Preparations have been completed for sinking the Julie shaft another 250 ft. preliminary to development and mining a lead-zinc-silver orebody, locally known as the Hornfels orebody. Active development of the gold zone is planned for the new level, as well as exploration of the Antler Peak limestone lying in the hanging wall of the Virgin fault at the new elevation.

Actual shaft sinking operations were started early in February. Ore on the new level has been delineated by diamond drill holes. L. E. Shaw, mine superintendent, has evolved several improvements in sublevel mining which will be described in detail in a separate article. The mill flowsheet differs little from that of the modern flotation plant in operation today. Mined ore is crushed in two stages, ground to flotation size in a ball mill-classifier installation, and floated, and the resultant concentrates are thickened and filtered. Installation of an additional concentrate thickener is planned. Electric power for the mine, mill, and camp is generated by a 1,800-hp. diesel power plant. Ralph Hayden is mill superintendent.

Greenan Placers Active

Starting at the mouth of Copper Canyon, about one-half mile below the Copper Canyon mill, is the Greenan Placers property, now in production. It is leased to the Natomas Co., of California. Here, a large Bucyrus-Monighan walking excavator with a 4½-yd. bucket is in operation in conjunction with a floating washing plant. Both units operated at one time in the John Day Oregon placer field, and were purchased by the Natomas Co. and transferred to the Greenan placers in 1941. Erection operations suspended during the war were completed during the latter part of 1946. The dragline dredge unit will work ground in the canyon area formerly exploited for gold by drift-gravel mining. The larger area of gravel extending below the canyon sector mentioned will be worked by a bucket-line dredge to be constructed at a future date, with such supporting facilities as a diesel power plant, shops, housing area, and others. R. G. Smith is general manager of Natomas Co., and C. E. McKay, resident manager, directs operations.

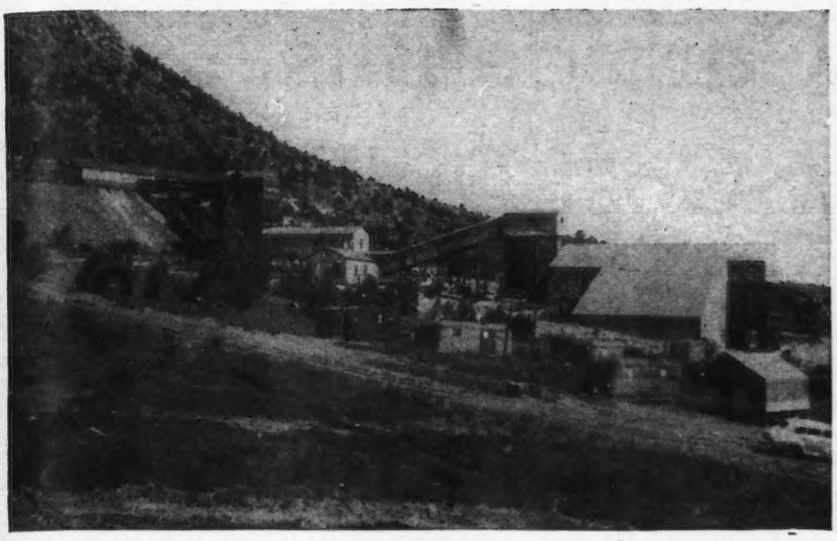
CONSOLIDATED CHOLLAR, at Gold Hill, will mill 500 tons of ore a day following completion of stripping north end of pit in April.

Two major enterprises are active in the Eureka area—namely, the Callahan Zinc-Lead Co., zinc-cadmium operation at Mt. Hope, about 25 miles northwest of the town of Eureka, and the Ruby Hill of Eureka Corporation, Ltd., at Eureka. Both properties were described in detail in the December 1945 issue of *Engineering and Mining Journal.* Relatively few changes have been made at the Mt. Hope mine and 250-ton flotation mill since then. Current production is averaging 225 tons a day. The horizontal and vertical orebodies occurring in the Mt. Hope mine are mined respectively by open-stope and shrinkage stoping methods. Because of occasional barren spots in the beds, diamond drilling ahead of stoping is necessary. A 160-ft. winze is now being sunk to develop lower beds. At the mill, where practice differs little from that described in the article mentioned, four additional flotation cells have been installed to treat final tailings with a view to increase over-all mill recovery. K. K. Hood is manager, and M. H. Howes, general superintendent. E. B. Lowman is in charge of the mill.

Sinking Fad Shaft

The Ruby Hill enterprise of Eureka Corporation, Ltd., continues to hold the attention and interest of Western mining men. Present work is centered in sinking the four-compartment Fad shaft to reach the zone north of the Ruby Hill fault and at a depth of 2,500 to 3,000 ft., at which diamond drill holes established the presence of good ore. The shaft was expected to be past the 1,600-ft. mark on March 1. Of the four compartments, three measure 5x5½ ft. inside the timber, and the manway is 4x5½ ft. Steel sets, each costing about $160, are used throughout.

While sinking through a shale formation a short time ago, it was necessary to install casing sets to hold back the ground, in addition to the regular support. Save for employment of the Riddell clamshell shaft-mucking arrangement, sinking operations follow standard practice. The Fad shaft is now connected with the Locan shaft, 1,400 ft. south, on the second or 800 level, by a drift completed recently, and a large pump station and sump have been established on this level in the Fad. An innovation is the use of electronic control boxes with probes on all pump stations in place of the conventional float-switch controlled starting and stopping arrangements. Of interest also is the electronic control layout envolved by Ned Allred, chief electrician, and



ZINC-CADMIUM ORE produced at the Mt. Hope mine of Callahan Zinc-Lead Co., near Eureka, is milled in this 250-ton flotation plant.

Vernon Manz, general foreman, to start and stop the sinking pump, the equipment being installed on levels above. This has eliminated carrying down to the pump 440-volt power and control facilities, thereby protecting the pump operator from possible shock and the control equipment from blasting. The Fad shaft is making 850 g.p.m. water.

To Drill 3-Ft. Hole

The company is seriously considering drilling a 3-ft. diameter hole a short distance from the Fad shaft from the surface to the 2,200 level for use as an emergency exit and ventilation. In contrast to the Newsom and Calyx methods, in which the hole is cored, the cuttings will be circulated out with a conventional oil-well rotary rig. On the surface, the diesel power house is being enlarged to accommodate a 1,000-kw. supercharged Worthington diesel engine. Operations are directed by George W. Mitchell, manager.

Consolidated Eureka Mining Co., following new financing by means of sales of shares in Utah, is planning further development of its property a short distance from the town of Eureka. Work to be undertaken will include diamond drilling, retimbering, drifting, and incidental development from the main Diamond tunnel and three shafts, 500, 270, and 770 ft. deep, respectively, giving access to some 8 miles of old workings.

No outstanding changes in operating methods have been made at the Liberty pit, at Ruth, or at the concentrator and smelter at McGill of Kennecott Copper Corporation. Tonnage handled at the concentrator varies between 17,000 and 18,000 a day. It includes production from the property of Consolidated Coppermines Corporation at Kimberly and from the 1,000-ft. Liberty pit extension worked under a joint agreement between Kennecott and Consolidated Coppermines. At the smelter, a second reverberatory furnace is under construction, but progress is somewhat hampered by manpower shortage. A development watched keenly by smeltermen is the automatic tuyere puncher under test on the converters. Several units of new design operated on one of the converters for many months have given most promising results. The small leaching plant, operated for some time on the tailings dumps, has been shut down.

Production at Consolidated Coppermines is somewhat lower than the regular 9,000 tons daily, chiefly because of manpower shortage. Start of production in the 1,000-ft. Liberty extension has necessitated changing both underground haulage routes and hoisting. The last-named operation has been transferred from the Emma shaft to the Morris shaft, with the Emma kept open for emergency use only. The Morris shaft has recently been enlarged and equipped with a 94-ft. steel headframe and hoisting machinery. The Tonopah pit, developed and worked during the war, has been shut down. Cash I. Cook is general manager.

In the Pioche area, ten mines, including the Ely Valley, Raymond Ely, Price, and Comet, are currently shipping ore to the 1,000-ton concentrator of Combined Metals Reduction Co. at Caselton. Daily production handled at the mill averages about 600 tons. No outstanding changes have been made in mill practice since my visit a year ago, but installation of a third flotation section is planned. The electronic pH controller added to the flotation department recently is performing according to expectations, and research work to develop an electronic pulp density control device is now in progress.

In the Caselton mine, use of scrapers is constantly being expanded to save labor, and comprehensive exploration of territory north and south of the Caselton shaft is planned. For this purpose long drifts are being driven on the 14 and 660 levels. The Comet mine, about 7 miles from the Caselton property, operated by David Gemmill, is reacting favorably to development, and ore shipped to the Caselton concentrator is of good grade. It is mined from an orebody about 15 ft. wide and several hundred feet long, now under development. Combined Metals Reduction Co. has recently made a long-term operating agreement with Comet Coalition Mines Co., and is now unwatering the Pan American incline with a view of developing the ore horizon to the north and south of this shaft. S. S. Arentz, general superintendent, directs operations of Combined Metals activities in Pioche.

Con. Chollar Active

Only one mining enterprise, that of Consolidated Chollar Gould & Savage Mining Co., Thomas V. Barton, president, is active on the Comstock Lode. Milling operations were suspended during the latter part of December 1946, and current activities are centered in stripping the north section of the company's open pit at Gold Hill at the rate of 3,000 yd. a day. Active production is expected to be started again early in April. F. V. Dempsey, general superintendent, is in charge of operations. William Donovan, veteran Comstock Lode mine operator and owner of the 100-ton Donovan mill, is installing large milling equipment with a view of handling daily mine production on an 8-hr. shift basis when operations are resumed. Work at the properties of Dayton Consolidated Mining Co. is confined to development and diamond drilling.

Tungsten Carbide Bits—Key to Low-Cost Drilling

FIELD TESTS thus far with Carboloy tungsten-carbide inserts mounted in Jackbits promise substantial drilling economies. The new technique of mounting the inserts permanently in four-point bits was a joint development of the Carboloy Co., Inc., Detroit, Mich., and the Ingersoll-Rand Co., which produced the alloy-steel drill rod with a special stud connector to mount the bits on the rod. The new drill bit is completely interchangeable with the latest type of steel 4-point Jackbits.

Carboloy cemented carbide is produced by converting tungsten and lampblack into tungsten-carbide under high heat. This is mixed in powder form with a metallic binder such as nickel or cobalt, pressed into shape, and sintered at high temperatures.

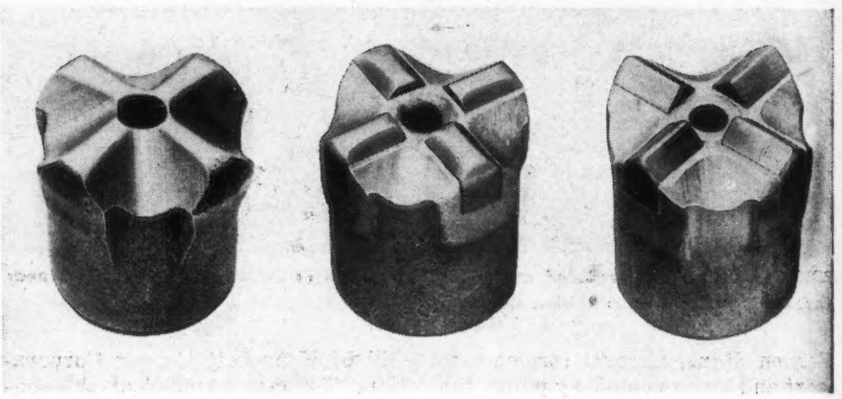
In Europe, where drilling speeds and air pressures have been lower than in the United States, chisel-type drill rods with carbide inserts have enabled operators nearly to equal the drilling speeds obtained with steel bits in the United States. For example, in a certain rock formation normal drilling speed may be 12 to 14 in. per minute. The equivalent speed in Europe for this type of rock using steel bits would be about 6 in. per minute. Carbide-type chisel-edge bits raised this speed to 11 to 12 in. per minute.

In contrast, the new Jackbit with Carboloy inserts drilled the same formation at rates from 25 to 30 in. per minute. Fifty inches per minute has been obtained with heavy drifters in some rock formations.

Dull Bits Still Drill

Curiously enough, dulling the cutting edges until they are quite flat does not appreciably reduce the cutting effectiveness of the new bits. A steel bit would be replaced immediately if dulled to the same degree, but the carbide bits are good for many feet more. In one hard rock a carbide bit drilled twice as many feet after it had been dulled as it had drilled up to that point.

In a granite in which steel bits will drill only 2 to 3 ft. before dulling, Carboloy insert bits will drill up to 250 ft. In general, the new bits will produce 50 to 200 times the depth of hole obtained with steel bits without reconditioning. In Indiana limestone, a test was discontinued after drilling some 650 ft. without appreciable dulling of the bit. The loss in gage was only 0.006 of an inch.



STEEL BIT at left after drilling 2 ft. in granite. New sintered Carboloy insert bit before drilling (right) and after drilling 249½ ft. in same granite (center).

Other advantages of the bits over former steel types are:

1. Miners do not have to handle as much steel as formerly. One new bit will suffice where previously several changes of steel had to be employed.

2. As loss in gage is negligible, the holes are uniform in bore instead of "tapered" as with steel bits. This means less rock has to be drilled to produce a hole to accommodate a given size of powder charge.

3. Lighter equipment can be used because smaller bits can be used to drill a hole of given diameter. In one mine a 3-in. machine will do the same job that a 3½-in. machine did formerly.

4. Compressed air requirements may be reduced by one-third to one-half, according to some field reports.

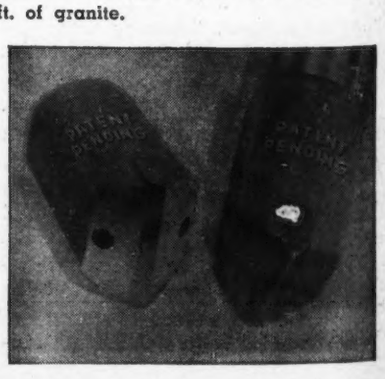
Chisel-Type Bit

Another carbide bit for use in percussion drills operating at air pressures of 80 to 120 lb. is the cemented carbide chisel type recently introduced by Kennametal, Inc., Latrobe, Pa. Water holes in both levels prevent clogging during wet drilling.

In one test it is reported that a single bit drilled 50 ft. of 1⅜-in. hole through granite before the bit was taken off the steel because of wear. It was estimated that the hole was only 3/32 in. smaller at the end of the drilling than at the start. Drilling speed was 12 in. per minute. Other tests were made in quartz, sandstone, and limestone.

Advantages claimed for the chisel-type cemented carbide bit are: Lower compressed air consumption, longer periods of operation between bit changes, and faster drilling speed than with ordinary types of steel bits.

NEW CEMENTED-TYPE KENNAMETAL CHISEL BIT before and after drilling 50 ft. of granite.



MARKETS—Trends and Prices

Copper and Lead Prices Higher as Active Buying Continues—Silver Market Unsettled

DEMAND FOR MAJOR NON-FERROUS metals throughout March continued on the same high plane as in the two preceding months. The first quarter of 1947 established an all-time peak in general industrial activity for a peacetime period. The price situation was mixed, with the trend upward in both copper and lead. Our weighted index of nonferrous metals prices for March advanced to 150.71, a net gain for the month of 10.29 points. The rise would have been greater except for an unsettled price situation in silver.

Copper became firmly established at 21½c., Connecticut Valley, as all sellers moved up to this level on March 8. Throughout the month the world level, based on sales of foreign copper for foreign as well as domestic consumption, averaged around 1¼c. per pound above the domestic quotation. Interest in copper centered in the move to waive temporarily the import tax of 4c. per pound on foreign copper to permit domestic consumers to purchase foreign metal now that the Government is withdrawing from the field. The RFC released approximately 28,500 tons of foreign copper to domestic consumers during March on the basis of 21½c., Valley. Additional tonnages will be released from the Government's stocks in April, but thereafter the quantities available from that source are likely to be small and consumers will be forced to rely on domestic and foreign copper that they can purchase in the open market.

As March ended the Senate Finance Committee was considering a bill passed by the House that would waive the duty for a period of two years. The Senate group appeared to favor a suspension of the duty for a shorter period, and a compromise on the duration is in sight, according to observers in Washington. In any event, consumers lost much of the fear that served to upset the market in the first half of the month when doubt existed over the ultimate fate of the proposed tariff legislation. Without temporary suspension of the duty, it was held in many quarters, the domestic price would have to rise to the equivalent of the world price plus the 4c. duty. The market continued strong throughout the month, and most traders held to the view that the two prices eventually will come close together and continue on about an even basis until world production increases sufficiently to remove the strain from the market.

On the last day of March the British Ministry of Supply raised the price of copper for the British home market £10 per long ton. This action was expected among copper producers, for it was common knowledge that the British authorities would have to raise their selling basis to the prevailing world market price to avoid losses. British policy appears to be to adjust the price structure from time to time to cover costs incurred over a three-months' or longer period. How this will operate when prices again move downward, always a possibility, is a question that practical sellers operating in a free market are wondering about.

The February statistics of the domestic copper industry placed production of refined copper at 77,591 tons, against 80,144 tons in January. However, the daily rate of production in February was higher than in the preceding month. Deliveries of refined copper to domestic consumers in February amounted to 117,734 tons, against 143,692 tons in January. Included in the February deliveries of copper there were 38,108 tons of foreign metal supplied by RFC. Consumption of copper by the fabricating division of the industry was estimated at 115,317 tons, against 139,263 tons in January. Fabricators reduced consumption in February because of the tight situation in copper, it was claimed.

Lead was advanced by the American Smelting & Refining Co. to 15c. per pound on March 3. The advance did not become general until the following day. Producers contend that consumers were largely responsible for the advance in lead prices to the highest level on record. Offerings of lead from foreign sources at higher prices than those named by domestic producers were eagerly absorbed by consumers, which had the effect of lifting the general price level. St. Joseph Lead Co. declared that it raised its price reluctantly, as it felt that supply and demand are gradually being brought into balance. It was pointed out that the lead industry sold substantially more lead for delivery over the first three months of 1946 than in the same period last year.

The British home market for lead advanced from £70 per long ton to £90, for the same reason that the Ministry of Supply raised the price of copper.

Compared with copper and lead, zinc presented no great problem to producers. The quotation was unchanged throughout the month on the basis of 10½c. for Prime Western, East St. Louis. Except for a tight situation in Prime Western and Special High Grade, supplies are ample.

Silver passed through an exciting period. The New York Official price as February ended was 80¼c. an ounce. The quotation advanced to 86¼c. on March 6. Then it became known that exchange controls had been imposed by Indian authorities to halt the conversion of rupees into silver. The lull in buying that followed this action caused the price to develop fresh weakness, and the official quotation soon dropped back to 70¾c. This resulted in renewed consumer buying and a quick recovery in the price to 77¼c.

Hugh Dalton, Chancellor of the Exchequer, informed the British House of Commons that 11,750,000 oz. of silver

Mercury Statistics—1945 and 1946

(Bureau of Mines)

Production, general imports, exports, and consumption of mercury during 1945 and 1946, by quarters, in flasks of 76 pounds:

	Production	General Imports	Exports	Consumption
1945:				
January-March	8,200	5,944	62	16,400
April-June	9,300	21,882	122	24,900
July-September	8,950	24,503	104	15,000
October-December	4,150	19,179	750	7,600
Totals	(a) 30,763	71,508	1,038	63,900
1946:				
January-March	5,550	1,256	184	(c) 6,700
April-June	7,000	4,599	200	(c) 8,000
July-September	6,500	8,002	341	7,300
October-December	6,150	9,205	182	8,800
Totals	(b) 25,200	23,062	907	30,800

(a) Final annual figures. (b) In addition at least 2,000 flasks were recovered from the treatment of battery plates and scrap and calomel in the first quarter, 1,400 in the second, 200 in the third, and 300 in the fourth. (c) Revised figures.

At the end of 1946 the Metals Reserve's stocks of mercury amounted to 20,884 flasks; consumers' and dealers' 16,400 flasks; and producers' reporting to the Bureau of Mines 2,599 flasks.

of foreign origin was purchased from United States sources by Belgian buyers through British brokers in the first two months this year. In addition, Belgian buyers also bought 500,000 oz. from Russia. He said that virtually all of the silver obtained by the Belgians was for Indian accounts. Great Britain, he said, purchased 1,750,000 oz. from the United States in the same period. In market circles here it was known that the Belgians converted Indian funds into dollars at a substantial profit.

The tin situation attracted wide interest on announcement that the Argentine had entered into an agreement with the Bolivians to purchase 8,000 tons of tin contained in concentrates a year over a period of five years. On the tonnage acquired in the first year the settling basis is the equivalent of 76c. per pound; thereafter the price would be established annually through negotiation. This news virtually forced action here to purchase tin concentrates on the same terms. RFC announced that between 10,000 and 12,000 tons will be exported from Bolivia to the United States in 1947. Following the rise in the price that the United States will pay for Bolivian tin concentrates for shipment this year, the domestic quotation for "Grade A" tin will probably be adjusted upward. However, the quotation for the domestic trade was maintained at 70c. throughout March. The British Ministry of Supply advanced its home price for 99 percent tin on March 29 to £437 per long ton, the former quotation being £380 10s.

Domestic producers of antimony advanced the price sharply on March 15 to bring the quotation more in line with the world price. Until China once again becomes an important source for antimony, the world shortage will remain acute.

Tungsten ore improved pricewise on increased bidding for the material in the world market by foreign consumers. Until recently, the market was largely tied to the state of business in the United States. Increased demand for high-temperature alloys has been a factor.

Quicksilver was unsettled on rumors that agents of European producers sold metal in this market at lower prices. So far, however, this has influenced the spot quotation only slightly.

Major Metals

U. S. DAILY AND AVERAGE PRICES

1947 Mar.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
1	19.225	20.925	70.000	14.000	13.800	10.500
3	20.650	21.425	70.000	14.875	13.800	10.500
4	19.725	21.800	70.000	15.000	14.800	10.500
5	19.800	21.800	70.000	15.000	14.800	10.500
6	19.800	21.925	70.000	15.000	14.800	10.500
7	19.975	21.975	70.000	15.000	14.800	10.500
8	21.225	21.925	70.000	15.000	14.800	10.500
10	21.225	22.175	70.000	15.000	14.800	10.500
11	21.225	22.300	70.000	15.000	14.800	10.500
12	21.225	22.175	70.000	15.000	14.800	10.500
13	21.225	22.375	70.000	15.000	14.800	10.500
14	21.225	22.400	70.000	15.000	14.800	10.500
15	21.225	22.225	70.000	15.000	14.800	10.500
17	21.225	22.150	70.000	15.000	14.800	10.500
18	21.225	22.425	70.000	15.000	14.800	10.500
19	21.225	22.425	70.000	15.000	14.800	10.500
20	21.225	22.425	70.000	15.000	14.800	10.500
21	21.225	22.350	70.000	15.000	14.800	10.500
22	21.225	22.425	70.000	15.000	14.800	10.500
24	21.225	22.450	70.000	15.000	14.800	10.500
25	21.225	22.425	70.000	15.000	14.800	10.500
26	21.225	22.550	70.000	15.000	14.800	10.500
27	21.225	22.675	70.000	15.000	14.800	10.500
28	21.225	22.675	70.000	15.000	14.800	10.500
29	21.225	22.425	70.000	15.000	14.800	10.500
31	21.225	22.525	70.000	15.000	14.800	10.500
AVERAGES FOR MONTH						
Mar.	20.911	22.206	70.000	14.957	14.723	10.500
AVERAGES FOR WEEK						
Mar.						
5	19.679	21.217	70.000	14.479	14.133	10.500
12	20.779	22.079	70.000	15.000	14.800	10.500
19	21.225	22.333	70.000	15.000	14.800	10.500
26	21.225	22.438	70.000	15.000	14.800	10.500
CALENDAR WEEK AVERAGES						
Mar.						
1	19.317	20.696	70.000	13.833	13.633	10.500
8	20.196	21.808	70.000	14.979	14.633	10.500
15	21.225	22.275	70.000	15.000	14.800	10.500
22	21.225	22.367	70.000	15.000	14.800	10.500
29	21.225	22.533	70.000	15.000	14.800	10.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1947 Mar.	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	402.500	(e)	(e)	(e)	$35.00
3	402.500	81.250	48½d.	172s. 3d.	35.00
4	402.500	82.750	49d.	172s. 3d.	35.00
5	402.500	84.750	50d.	172s. 3d.	35.00
6	402.500	86.250	52d.	172s. 3d.	35.00
7	402.500	86.250	52d.	172s. 3d.	35.00
8	402.500	(e)	(e)	(e)	35.00
10	402.500	88.750	52d.	172s. 3d.	35.00
11	402.500	78.000	47¼d.	172s. 3d.	35.00
12	402.500	77.000	47¼d.	172s. 3d.	35.00
13	402.500	75.750	46½d.	172s. 3d.	35.00
14	402.500	75.500	46½d.	172s. 3d.	35.00
15	402.500	(e)	(e)	(e)	35.00
17	402.500	74.500	46d.	172s. 3d.	35.00
18	402.500	70.875	45½d.	172s. 3d.	35.00
19	402.500	70.875	44d.	172s. 3d.	35.00
20	402.500	70.875	44d.	172s. 3d.	35.00
21	402.500	72.750	44d.	172s. 3d.	35.00
22	402.500	(e)	(e)	(e)	35.00
24	402.500	77.250	46d.	172s. 3d.	35.00
25	402.500	77.250	46¾d.	172s. 3d.	35.00
26	402.500	75.250	46d.	172s. 3d.	35.00
27	402.500	73.250	45d.	172s. 3d.	35.00
28	402.500	74.250	44½d.	172s. 3d.	35.00
29	402.500	(e)	(e)	(e)	35.00
31	402.500	75.750	46d.	172s. 3d.	35.00
AVERAGES FOR MONTH					
Mar.	402.500	77.339	47.083d.	—	35.00
AVERAGES FOR WEEK					
Mar.					
5	402.500	81.450	—	—	—
12	402.500	82.250	—	—	—
19	402.500	73.500	—	—	—
26	402.500	74.675	—	—	—
			—	—	—

Calendar week averages, New York Silver: March 1st, 76.750; 8th, 84.250; 15th, 78.000; 22nd, 71.975; 29th, 75.450.

(e) Not quoted (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.275c. per pound, the average differential for freight and delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade in most instances is 1¼c.

Quotations for lead are for common lead.

(c) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions, and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS—Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for February and March:

	Feb.	March
Quicksilver, N. Y. flask	86.864	86.846
Antimony (a)	31.190	33.748
Antimony, bulk, Laredo	28.250	30.808
Antimony, in cases, Laredo	28.625	31.212
Antimony, Chinese (b)	.....	.....
Platinum, oz. troy	58.000	58.000
Cadmium (c)	161.364	175.000
Cadmium (d)	163.864	177.500
Cadmium (e)	166.364	180.000
Aluminum ingot	15.000	15.000
Magnesium	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

100 is composite for 1922-3-4. (Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1937	90.86	1942	86.80
1938	73.67	1943	88.74
1939	77.71	1944	88.74
1940	79.22	1945	90.86
1941	83.49	1946	110.057

	1945	1946	1947
January	88.74	96.42	140.88
February	88.74	96.42	140.42
March	88.74	96.42	150.71
April	88.74	96.42	.....
May	88.74	96.42	.....
June	88.74	107.16	.....
July	88.74	117.11	.....
August	88.74	113.32	.....
September	91.16	113.32	.....
October	96.40	114.25	.....
November	96.42	131.23	.....
December	96.42	142.19	.....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major non-ferrous metals. Prevailing delivered prices for consumers in the United Kingdom follow:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	137	0	0
Fire refined, high conductivity	137	0	0
Fire refined, high grade	136	10	0
Fire refined, min. 99.2 percent	135	10	0
Fire refined, min. 99.7	136	0	0
Hot rolled black wire rods	132	0	0
LEAD:			
Soft, foreign, duty paid	90	0	0
Soft, Empire	90	0	0
English refined	91	10	0
ZINC:			
Foreign (G.o.b.), duty paid	70	0	0
Domestic (G.o.b.)	70	0	0
Prime Western and debased	79	0	0
Refined and electrolytic	70	15	0
Minimum 99.99 percent	72	5	0
TIN:			
Ingot, 99 percent	437	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(March 31, 1947)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, domestic, spot, lb., 5 tons or more, in cases	35.940
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$1.75
Calcium, lb. ton lots, 97 @ 98 percent, cast	$1.85
Chromium, 97 percent grade, lb.	89c.
Cobalt, 97 to 99 percent, per lb.	$1.50
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 percent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$58.00
Quicksilver, flask of 76 lb., 25 flasks or more	$86.00
Selenium, 99.5 percent, lb.	$1.75
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$20.00
Titanium, 96 to 98 percent, lb.	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$12.00@$14.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal)	$36.00@$37.00
48% Cr_2O_3, 3 to 1 ratio	$38.00@$39.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$5.95
Mesabi bessemer	$5.70
Old Range non-bessemer	$5.80
Mesabi, non-bessemer	$5.55
Lead (Galena) 80 percent, Joplin, Mo., ton	$195.65
Manganese Ore—Per long ton unit of Mn, basis 48 percent manganese, subject to premiums and penalties, f.o.b. cars Atlantic and Gulf ports, duty paid, 67@69c.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid	$24.00@$26.00
Domestic, scheelite, 60 percent and upward	$25.00@$26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	6c.
Cobalt Oxide, 70 to 71 percent, lb.	$1.06
Copper Sulphate, 100 lb.	$7.60

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent, per lb. of Cr contained	15.60c.
Ferromanganese, 78 to 82 percent, gross ton	$135.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	7.45c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.08
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 percent C, per lb., contracts	6.45c.

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$8.50@$9.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.25@$8.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$5.00
Domestic, chemical, 55 to 58 percent	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 70 percent, all rail movement, ton	$33.00
Acid 98 and 1 percent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica: Domestic producers quote on punch and sheet as follows: Punch, 22c. per pound; 1½x2 inch, $1.10; 2x2 inch, $1.60; 2x3 inch, $2.10; 3x3 inch, $2.75; 3x4 inch, $3.50; 3x5 inch, $4; 4x6 inch, $5. Wet ground, very fine, $90 per ton. Special grades command premium. Bulk sales dry ground, $32.50 per ton. Scrap, $28 per ton and up.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f, Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$33.00
Steel, base price, Pittsburgh Billets, gross ton	$42.00
Structural shapes, 100 lb.	$2.65

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Mineral Premium Plan Due for House Consideration

Six versions of legislation to continue the Premium Price Plan for copper, lead, and zinc, introduced by five representatives of mining states in the House of Representatives, have been consolidated into a final bill entitled the National Minerals Development and Conservation Act of 1947.

The new bill, introduced by Rep. Charles H. Russell, of Nevada, was due to be approved by the House Committee on Public Lands late in March.

Principal differences between the old and the new plan are: administration of a subsidy, which would include all strategic materials listed in the Stockpile Act, by a new agency in the Interior Department; premium payment ceilings for all minerals; and sale of all metals, minerals, and ores derived from the plan on the open market except on Presidential order transferring them to the national stockpile.

Development and conservation payments would be made to producers of newly mined ores of copper, lead, and zinc, and, at the discretion of the director, for other newly mined ores. Payment ceilings would be: 28c. for copper, 18c. for lead and zinc, and the highest market price paid for other metals and minerals during the years 1942 to 1946, inclusive. The ceilings could apply unless the director believes special consideration necessary for the "stimulation" of exploration or production of a particular metal or mineral.

One condition in making payments would be that "recipients would pay no royalties on such portions of the amount received by the producers in excess of market prices, except where landowners share in the expense of transportation, milling, and smelting of ores."

Krug Will Set Up Large Mining Advisory Committee

Interior Secretary J. A. Krug last fall asked the American Mining Congress to designate a special group to help him form a minerals industry advisory committee. This is to be along the lines of the National Petroleum Council, an 85-man board of advisors on petroleum problems.

A nine-man committee met with the secretary late in March. The "committee to form a committee" advanced three major suggestions.

First, the nine concluded that selection of membership in the advisory group would have to be up to industry, with Krug asking for nominations. All agreed that appointment would have to be wide open to prevent action by the anti-trust division of the Justice Department.

Second, it was suggested that a separate advisory committee be established for coal. This would give Interior three advisory groups, one each for oil, coal, and other minerals.

The third suggestion was that the new "other minerals" committee be limited to about 30 men, to be selected from among 10 subcommittees of seven men each. This would not only limit the size of the group but would provide for representation across the industrial board.

Action in forming the new committee will come slowly. Secretary Krug, because of his experience last year in forming the petroleum group, will make each step carefully, after full clearance from anti-trust watchdogs. A lukewarm industry will have to be handled carefully also. One main industrial charge, that the advisory committee would not be representative of large and small producers in all mineral fields, is partially set aside by suggestions made at the meeting last month.

Uranium and Thorium Regulations Tightened

Revised regulations for controlling the raw materials of the atomic bomb were announced Mar. 20 by the United States Atomic Energy Commission.

Transfer and delivery of ores containing less than 10 pounds of uranium and thorium will be permitted for domestic consumption virtually free of restrictions. However, any person accumulating 10 pounds or more of these elements must report to the Commission within 30 days.

License applications will be handled by the United States Atomic Energy Commission, P.O. Box 42, Station F, New York 16, N. Y.

Suspension of Copper Import Tax Anticipated

In mid-March the House passed a revision of Representative Patterson's bill (E.&M.J., March, p.87) to waive the 4¢ per pound excise tax on copper imports. The revised bill suspends the tax for two years.

There being only limited resistance to a temporary suspension of the tax, in late March the Senate was expected to pass the measure quickly, probably with the suspension period trimmed down to one year or 18 months.

Federal Trade Commission Attacks Copper Producers

Blame for the present copper shortage both here and abroad, with the possibility of a copper-buying "panic" in the near future, is placed on six men, four of them heads of American corporations, by the Federal Trade Commission in a report submitted to Congress in late March. The words "cartel" and "monopoly" are freely used in the sharply worded document.

Reason for the report is to "provide a basis for further consideration by the legislative and executive branches of the Government of ways whereby American industry and the consumer may receive maximum protection in the future both as to adequacy of supply and reasonableness of price," according to the Commission.

"The copper situation is particularly serious, not only because of the concentration of control of the ore reserves and the productive capacity, but also because the domestic supply is inadequate to meet the demands of high level national production and employment," the report states. "Furthermore, the production of foreign copper, on which the U. S. will become increasingly dependent, is likewise dominated by a few corporate groups which in the past have operated cooperatively in cartels to regulate production and prices."

Those stated by the Commission in its report as being "six, or at most nine, men able to set the operating policies of what is in effect a world monopoly in the production of copper" are listed as Cornelius F. Kelley, chairman of the board of Anaconda Copper Co.; E. T. Stannard, president of Kennecott Copper Corporation; Louis Cates, president of Phelps Dodge Corporation; A. Chester Beatty, chairman of the boards of Rhodesian Selection Trust, Roan Antelope Copper Mines, Ltd., Mufulira Copper Mines, Ltd., and a director of Rhokana Corporation, Ltd.; Robert C. Stanley, chairman of the International Nickel Co., and Fred Searls, Jr., vice president of Newmont Mining Corporation.

"Ownership of a large part of the nearly 50% of known world reserves controlled by American nationals is concentrated in three U. S. mining companies—Anaconda, 23.10%, Kennecott, 11.83%, and Phelps Dodge, 6.32%," the report stated.

Noting that the blame for the reduced world output—of copper—is generally placed on shortages of labor supply, lowered productivity of labor, and strikes, the Commission states that a world-wide stockpile of the metal, about 700,000 tons, at the beginning of

1946 "was viewed with misgivings within the industry." The report continues: "In order to dissipate that stockpile, it would not matter whether the steps were direct curtailment of production at the mines through the action of the management, or passive curtailment through delays in settling labor disputes which were widely prevalent in industry. When, to the inventory situation, is added the confusion and uncertainties in the field of Government controls of copper in the spring of 1946, with the possibility that by mid-year all price controls might be removed with consequent benefit to the producers of copper, it would appear that dominant producers might well consider it to their advantage to permit the continuance of labor difficulties to curtail production, at least until such time as the large stockpile might be drawn down."

Investigation into the control of domestic copper industries by the Commission leads to the statement that "the situation, as the United States approaches the point where its production from dwindling reserves is becoming inadequate to supply its own needs, is that four integrated interests, namely Kennecott, Anaconda, Phelps Dodge, and American Smelting & Refining Co., dominate the production, smelting, refining and fabrication of copper within the United States" and "are obviously in a position to influence the copper market."

Following a heavily documented attack on the cartel operations of copper producers both here and abroad following the last war, the report stated that "the seriousness of the copper problem, both in its nearby and long range aspects, and, particularly the relative nearness of possible outbreak of panic bidding for copper, point to the immediate need for both the legislative and executive branches of the Government to consider whatever steps, both domestic and foreign, may be feasible to protect the interests of the non-integrated fabricators from discrimination in the distribution of inadequate supplies and also to protect the national economy from serious unemployment." . . .

"There should be a most careful scrutiny of the production and distribution policies and practices of the domestic copper producers to assure equitable distribution among all copper users. Finally, in the international field, the need exists, and the time appears opportune, for the United States to take a position energetically opposing the resurrection of international cartels, either governmental or private, to the end that world production and distribution of copper may be conducted on a competitive and open market basis," the report said.

Pursuant to the FTC report, in late March Representative Crawford, of Michigan, introduced a resolution providing for Congressional investigation of the copper industry.

COL. JAMES BOYD

James Boyd Nominated As Bureau of Mines Director

Col. James Boyd, former dean of the faculty of the Colorado School of Mines, has been nominated by the Secretary of the Interior to become the new director of the Bureau of Mines. He will replace Dr. R. R. Sayers, who will return to the Public Health Service.

Colonel Boyd was born in Kanowna, Western Australia, Dec. 20, 1904. He came to America from England in 1922, becoming a citizen in 1926. He graduated from the California Institute of Technology in 1927, and served as an industrial field engineer in geophysical prospecting from 1927 to 1929. He obtained a Master of Science in geophysics from Colorado School of Mines in 1932, a Doctor of Science in geology in 1934, and served on the faculty of that institution from 1929 to 1941.

From 1940 to 1941 he was president of Gold Crest Mining Co. In August 1941 he became chief of the metals section, Office of Undersecretary of War. From 1942 to 1944 he was chief officer of liaison and coordinance in the office of the Director of Materiel, and was Army representative on the program adjustment committee of the WPB. He was also Army representative on the copper committee of the Combined Raw Materials Board, and adviser on materials to the American representative on the Combined Raw Materials Board.

He was executive officer to the director of matériel of Army Service Forces from 1944 to 1945. From April 1945 to June 1946 he was director of the industry division, Office of Military Government in Germany, American representative on the industry committee, fuel committee, liquidation of war bonds committee, and the level of industry committee of the Allied Control Authority for Germany.

On Sept. 1, 1946, he was elected Dean of the faculty of the Colorado School of Mines, from which post he resigned to accept the Bureau task.

As Colonel Boyd's nomination was being considered by the Senate, union leader John Lewis denounced the appointment as a "political deal," a criticism which appears to be unfounded. Lewis also asserted that Boyd was unqualified to deal with coal-mine safety.

This attitude was widely interpreted as a move to register Lewis' insistence on being consulted about the directorship appointment and to embarrass Secretary Krug, who had given Lewis the biggest setback in his career by preventing a coal strike last fall. Probably, had the Centralia coal-mine disaster not happened, the committee would have ratified the nomination without hesitation. The disaster, and Lewis' accusation of Krug's responsibility therefor, made the whole affair a political hot potato. In early April what action the Senate would take was doubtful.

New Board Proposed to Handle Stockpiling

The same old civilian vs. military argument which marked the "in again-out again" progress of the Stockpile Act in the last Congress has popped up again, this time in Army-Navy merger legislation.

In an otherwise innocuous piece of legislation introduced last month, President Truman inserted a plan for the establishment of a civilian National Security Resources Board which would report directly to the Chief Executive. The board would take over the job of coordinating military, industrial, and civilian mobilization, leaving to the Army-Navy Munitions Board the job of planning only the military phases of mobilization.

Immediate responsibility of the NSRB would include administration of the program for stockpiling of critical materials, a job now handled by the Munitions Board. The civilian group would also be charged with advising the President on "strategic relocation of industries, services, government, and economic activities whose continuous operation is essential to the nation's security."

Assessment Work Must Be Resumed After June, 1947

Holders of mining claims are reminded that to retain ownership of their property they must resume assessment work after July 1, 1947. The obligations to perform $100 worth of work on each claim annually was suspended during the war and until six months after the cessation of hostilities.

President Truman's declaration of the end of hostilities on Jan. 1 ended the suspension on assessment work.

NEWS OF THE INDUSTRY

MMSW Revolt Forces Robinson Resignation

The resignation of Reid Robinson as president of the International Union of Mine, Mill & Smelter Workers on March 10 brought to a climax the insurgent movement within the organization which has been openly fighting Robinson's alleged communistic leadership. The rank and file revolt began late in January, led by John J. Driscoll, secretary of the Connecticut CIO council, and John J. Mankowski, international representative for District 6, comprising 55 locals in Connecticut, New Jersey, Pennsylvania, and West Virginia. More recently 25 locals with 5,500 members in Illinois and other midwestern states were reported to have withdrawn under the leadership of Joseph Verdu, international representative for District 3. The Provisional Metal Workers Council, set up in opposition to the international union headed by Driscoll, claimed 28,000 members of 49 seceded locals at the time of Robinson's resignation.

The elevation of Maurice E. Travis, vice president, to succeed Robinson, announced simultaneously, met with a statement by the secessionist leaders that this did not alter the position of the group, which had withdrawn "in revolt against the undemocratic, procommunist control of the international union." "Our fight will not be ended," the statement went on, "until the undemocratic, totalitarian forces within Mine, Mill, and in the CIO are reduced to impotence. It is significant that in his valedictory speech to the Mine, Mill executive board Mr. Robinson attacked personally the leadership of President Philip Murray and CIO vice president Allan Haywood. . . . Our membership will not be satisfied with a resignation which turns over the presidency to Maurice Travis, who has been the real power behind Mr. Robinson for many months."

Robinson, a native of Butte, Mont., who has been president of IUMMSW since 1936, issued a long statement in which he asserted that "union-busters have seized upon a mistake of mine and magnified it out of all proportion in order to discredit the union." He scored "reactionary forces within CIO" who "have deliberately ignored our membership's consistent refusal to let Mine, Mill be torn asunder over this false issue." The reference to "a mistake of mine" was not amplified but is presumed to relate to an alleged attempt by Robinson to negotiate a $5,000 loan from an employer.

At a meeting of the executive board of the CIO held soon after Robinson's resignation a three-man committee was named to look into IUMMSW's affairs and to conciliate and mediate existing differences between the Travis- and Driscoll-led groups. This committee is composed of Jacob Potofski, of the Amalgamated Clothing Workers; Van A. Bittner, of the United Steel Workers; and R. S. Buckmaster, of the United Rubber Workers.

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Bethlehem to Expand Iron-Ore Sources

Bethlehem Steel Corporation plans to draw on new sources in Latin America for substantial amounts of iron ore "sometime during 1948," according to the annual report for 1946. The corporation has allocated $37,500,000 for the development of iron-ore properties and the construction of ore storage facilities, trans-shipping stations, and river vessels. Iron-ore properties are held in Chile, Cuba, Mexico, and Venezuela.

Major Potash Deposit Found in Saskatchewan

Discovery of an important source of potash in Canada was recently announced by J. L. Phelps, Resources Minister of Saskatchewan, who termed it Canada's most important mineral find in 20 years. The deposit is said to lie 100 miles northwest of Saskatoon, in the southern part of the Province. Pointing out that Canada has been importing about $4 million worth of potash annually at an average cost of $40 a ton, Phelps declared that production of the mineral would "revolutionize" Canadian agriculture.

The potash is reported to occur in conjunction with a large salt bed underlying portions of Saskatchewan and Alberta.

New Mexico Association Holds Annual Meeting

The New Mexico Miners and Prospectors Association held its annual convention at Albuquerque on Feb. 22 and 23 with an attendance of about 500 members and guests. Among the papers presented were "Safety and Accident Prevention in the Small Mine Operation," by W. P. Morris, of International Minerals and Chemical Corporation, Carlsbad; "Labor's Stake in Mining," by W. D. Taylor, of Phoenix, Ariz.; and "Gold," by Robert S. Palmer, manager of Colorado Mining Association. Dr. Vincent Kelly, of Albuquerque, addressed the meeting on "Geologic Exploration in New Mexico," and H. E. McRay, of Tyrone, N. M., spoke on "The Growing Importance of the Non-Metallic Industry of New Mexico." A. M. Riddle, of the Colorado Fuel & Iron Co., discussed "The Relationship of Mining to Other Industries."

The principal address was delivered at the "slum gullion" supper, final event of the meeting, by Otto Herres, of Salt Lake City, Utah, vice president of Combined Metals Reduction Co. Speaking of the Government's responsibility to the mining industry, Herres said: "What the Government can do to aid in expanding the return of mineral discovery is to furnish an incentive for exploration and development of mines producing essential metals and minerals rather than penalize mining by tariff cuts, drastic profit restricting policies, and partisan labor regulations." Warning that individual property rights were being sacrificed to the "social pressures of mass civilization and collective organization," Herres pointed out the danger to mining, agriculture, and organized labor from too much Government control over economic affairs such as floors under wages and prices, ceilings on earnings, and deficit spending, which may turn out to be "booby traps on the road to a managed economy."

H. E. McRay, of Tyrone, was elected president of the association, succeeding E. C. Iden. Vincent C. Kelly, of the geology department of the University of New Mexico, and George S. Warner, general superintendent of Zuni Milling Co., were named vice presidents. Jack C. Pierce was reelected secretary and treasurer.

Among various resolutions adopted was one petitioning the State Senate to pass the open shop bill to give electors the opportunity of voting on "whether a man shall have a right to work in New Mexico, whether he is a union member or not."

A.I.M.E. Anniversary Meeting Features World Mineral Resources and Technology

Ore Reserves, Atomic Energy, Airborne Magnetometers, Shaped Charge, Geologic Theory, New Smelting Methods, Flame Photometer, and Rod-Mill Crushing Discussed—Communism Roundly Denounced.

More than 3,000 members and guests attended the World Conference on Mineral Resources held in conjunction with the 75th Anniversary Celebration of the American Institute of Mining and Metallurgical Engineers at the Waldorf-Astoria Hotel, in New York City, on March 17, 18, and 19. The conference was followed by three days of technical sessions at which more than 200 papers and reports were presented.

J. A. Krug, Secretary of Interior, classified American mineral supplies in three groups: (1) Abundant, (2) Those lacking entirely, and (3) Those which have been abundant but are now becoming depleted. The last-named group includes copper, lead, zinc, antimony, manganese, vanadium, chromium, mercury, gold, silver, fluorspar, and bauxite. To replace depleted reserves in the third group, Mr. Krug recommended a detailed study of our natural resources, and the following policies:

1. More intense search for domestic ores, and improved mining, milling, and refining techniques.
2. Acquisition from outside sources of minerals we lack.
3. Accumulations of stockpiles "by import, or preferably, and if economically feasible, by purchases from domestic mines."

Charles M. White, president of Republic Steel Corporation, said that in a "distressingly short period of years," whether five, ten, or even longer, Minnesota open-pit ores will not be able to supply the needs of the steel industry depending on Lake ore. Three other sources offer possibilities to supply this shortage: (1) Northeastern magnetites, which if energetically developed could supply much of the demand of the eastern Lake-ore steel plants; (2) Underground ore of the Mesabi Range; and (3) Magnetic taconites of the Mesabi Range, which comprise the greatest source of "possible future ore."

John M. Hancock, formerly a delegate to the United Nations Atomic Energy Commission, said that the United States plan calls for control of atomic energy "to the extent necessary for its use only for peaceful purposes." After international inspection is working "to our satisfaction," he said the plan proposed to stop making bombs, dispose of the existing ones, but "at no time release information regarding the bomb itself."

H. A. Winne, vice president of the General Electric Co., said that it is probable that experimental nuclear energy plants would be in operation in two to four years. Economic commercial plants would not make their appearance before two to five decades, he believed.

P. C. Keith, president of Hydrocarbon Research, Inc., blamed Germany's inability to produce the atomic bomb on the failure of her scientists to translate laboratory-scale processes to large-scale production. In contrast, he said that American engineers were unusually adept at anticipating problems of large-scale commercial plant design, and thereby helped the United States to win the atomic race.

Ore Reserves Are Ample

Ore reserves of copper, lead, and zinc are ample to supply production at the current rate for the next 15 to 25 years, and can supply enough for every essential need for the next 100 years, according to a paper prepared by Clinton H. Crane, president of the St. Joseph Lead Co. These reserves, he asserted, are based on existing mines and mining districts, and are qualified on the basis of present costs and conservative guesses as to the future selling prices of the metals involved. Six cents a pound was used for lead.

The Wednesday morning meeting was devoted to a forecast of mineral technology. Zay Jeffries, vice president of General Electric Co., took up the subject of "Metals and Alloys of the Future." He predicted that new techniques in metallurgy will develop out of nuclear energy research, citing in particular the use of radioactive tracers to determine the effects of minute impurities in metals. He also foresaw great expansion of the lightweight metal industry and more efficient utilization of metals generally, by combining high-cost metals with low-cost materials. He said that tens of thousands of new combinations of properties will be provided by alloys of the future, each combination best serving some particular use.

Discussing "Techniques of Mineral Exploitation of the Future," Louis S. Cates, president of Phelps Dodge Corporation and retiring president of the Institute, catalogued man's rapid ascent from the primitive to the scientific in developing methods for finding, exploiting, and beneficiating minerals. Looking at the future, he emphasized the growing importance of aluminum and magnesium and their alloys, which are bidding to become competitive with steel, and evaluated in detail the part the lighter metals may play in the continued growth of our mechanized era. Commercially pure aluminum with a tensile strength of only 13,000 psi., he said, can be brought up to a tensile strength of 80,000 psi. by various methods of cold working, alloying, and heat-treatment. This is well above the strength range of structural steel. Howland Bancroft, mining consultant, collaborated with Cates in preparing this paper.

Spruille Braden, Assistant Secretary of State, speaking at the 75th Anniversary Banquet, denounced "red and black Fascists" as current totalitarian menaces to man's progress. He said that mineral resources of other countries could be developed economically only by private industry, and not by our Government. It is the

JULIUS A. KRUG, Secretary of the Interior, guest speaker, chats with L. S. Cates (left), retiring AIME president, and Clyde E. Williams, president elect. Press Association Photo.

HANS T. LUNDBERG, left, vice president of Lundberg-Ryan Air Explorations, Inc., of New York and Toronto, Canada, takes a pre-delivery ride in the Model 47 helicopter his firm has purchased from Bell Aircraft Corporation. Magnetic equipment for air-flown geophysical surveys will be installed in the plastic teardrop in front of the cabin. It is planned to use the equipment in Canada, the United States, Mexico, and Venezuela, Mr. Lundberg described this equipment at the A.I.M.E. meeting.

duty of the State Department and our foreign representatives to assure fair treatment to American enterprise in foreign lands, be maintained.

On the other hand, private enterprise must strictly comply with the domestic laws of other countries, he cautioned, and "scrupulously refrain from the implication of interference in the political life of those countries."

Speaking on free enterprise, Virgil Jordan, president of the National Industrial Conference Board, said that the American people have drifted unmistakably toward "compulsory collectivism" during the past decade, and that by "confusion or cowardice" we have accepted foreign and domestic policies which inescapably promote the collectivism menace. He advocated generous aid to peoples who disarm to the level of the domestic constabulary, but advised the dropping of atomic bombs without compunction on those who conspire against the causes of peace and disarmament.

Clyde E. Williams, who was inducted into office as president of the Institute, read a message from Herbert Hoover, who said that engineers must bring about "production and more production" in our climb toward world peace and economic reconstruction.

Following an address on "The Future of Gold in the World Economy," by P. M. Anderson, managing director, Union Corporation, Johannesburg, S. A. (See editorial page 72), Willard L. Thorp, Assistant Secretary of State for Economic Affairs, pointed out that "tariffs are public barriers to trade while cartels may be private devices to the same end." The United States must reopen channels of world trade, he said, because of our need for foreign raw materials.

Geology and Geophysics

The outstanding features of the mining geology committee meetings were two papers on the origin of hypogene ores. Carlton D. Hulin called attention to the probable effects of boiling on deposition, assuming that boiling would lower the density of the solutions and increase turbulence and velocity. He pointed out that boiling probably accounts for the rareness of deposits in shallow zones, but that the beginning of boiling probably induces deposition in somewhat deeper zones.

John S. Brown presented "A Metallurgical Theory of Ore Genesis." He found fault with accepted theories of ore solutions on the basis that rocks were too impermeable to permit passage of sufficient volumes to account for known deposits. He suggested that hypogene deposits are made by high-temperature metallic vapors.

Three types of airborne magnetometers were described at the first Geophysics Section meeting. They are: The AN/ASQ-3A type, developed by the Navy, U.S.G.S., and the Bell Telephone Laboratories, which has been used successfully to survey more than 120,000 square miles; the Gulf type, developed by the Gulf Research & Development Co.; and the helicopter-borne type, which Hans Lundberg has developed. In some areas surveys could be made at costs varying from 20c. to $5 per acre with the last-named equipment. Because of the unusual maneuverability of the helicopter, these surveys are frequently 20 to 40% cheaper than land magnetometer surveys.

Non-Ferrous Metallurgy

W. T. Isbell, superintendent of the Herculaneum Division, St. Joseph Lead Co., described a vacuum machine to dezinc lead after it has been desilverized by the Parkes process. The zinc vaporizes under high vacuum and condenses on the inside of a removable bell which drops over a lead kettle. More than 90% of the zinc content is removed.

A paper by A. A. Collins, of the A.S.&R. Chihuahua plant, showed that the soda treatment of blast-furnace drosses at the El Paso smelter reduced the lead content in speiss and matte to 8.5%, compared with 17 to 19% by previous methods.

Operating zinc retort smelting on a 48-hr. cycle instead of a 24-hr. cycle has reduced operating costs slightly and effected substantial over-all economies, according to a paper by B. M. O'Hara and F. G. McCutcheon, of the Eagle-Picher Co. and Eagle-Picher Mining & Smelting Co., respectively.

The dithionate process for recovery of manganese from low-grade ore, treatment of Idaho-Wyoming vanadiferous shales, and the electrowinning of manganese from domestic ore were the chief topics discussed during the Friday afternoon session on non-ferrous metallurgy devoted to reduction of ferro-alloy ores, with R. G. Knickerbocker chairman. S. F. Ravitz described laboratory and pilot plant work for the recovery of manganese from low-grade ores by the dithionate process and recovery of vanadium from shales. The electrolytic process for recovery of manganese and tests covering low-grade manganese ores from California, Montana, South Dakota, and other states were explained by James H. Jacobs, U. S. Bureau of Mines. Tom Hendricks, of the U. S. Geological Survey, read a report covering a Japanese process for production of ferrovanadium from Manchurian iron ores.

Milling Methods

The sessions on milling methods began with a symposium of "operating ideas" collected by Messrs. Myers and Tower, of Tennessee Copper Co. Commenting on an automatic pulp-level control described therein, Mr. Myers said that if the mill feed could be ironed out, the need for such control gadgets would largely disappear. Oscar Lee, of Republic Steel, agreed that preparation of a uniform feed

(*Continued on page* 154)

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PERSONAL NEWS

As of Jan. 1, **F. F. Colcord** became vice president and consulting engineer of U.S.S.&R. Co. and **A. B. Marquand,** formerly managing director of the Cia. de Real del Monte y Pachuca, succeeded Mr. Colcord as vice president and manager of metal sales.

Dr. H. L. Keenleyside has been appointed by **Prime Minister MacKenzie King** to succeed **Dr. Charles Camsell** as Deputy Minister of Mines for the Dominion of Canada.

C. C. Camp, formerly of Zeballos, B. C., has joined the exploration staff of Butler Bros., St. Paul, Minn.

Hans Grove White has retired after 21 years in assay offices of the Consolidated Mining & Smelting Co. of Canada, Ltd.

W. S. Hamilton has been elected president of the Chamber of Mines of Eastern British Columbia. **I. G. Nelson** and **R. Hunter** are vice presidents, and **F. Pennoyer** is secretary.

Dr. Raoul Mitchell, former faculty member at Hunter College, New York, and officer of the Royal Engineers, has been named assistant professor of geology and geophysics at Tulane University, New Orleans, La.

Arthur J. Maese recently resigned his post with the Fresnillo Co., at Zacatecas, Mexico, to join the Charcas unit of Cia. Minera Asarco, S. A., at Charcas, S.L.P., as general mine foreman.

M. I. Signer has been appointed dean of the faculty of the Colorado School of Mines, replacing **Col. James Boyd,** who has been appointed director of the U. S. Bureau of Mines.

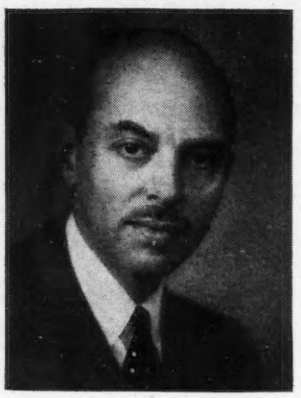
John Smeddle, formerly in charge of Demonstration Gold Mines, is now general superintendent of the Masinloc chromite mine, in Zambales Province, P. I. **Lee Blinzler,** mine superintendent, has been transferred to the Palatoc gold mine.

H. C. Peterson, of the Freeport Sulphur Co., New Orleans, has been elected secretary-treasurer of the Delta section of the American Institute of Mining and Metallurgical Engineers, to succeed **W. J. Gillingham,** who will go to South America.

R. J. La Belle, a metallurgist formerly with the International Nickel Co. of Canada, has joined the engineering staff of the Copper Range Co., at Painesdale, Mich.

Paul Allen, until recently with Inland Steel Co. at Ishpeming, Mich., has gone to Cyprus to accept a post with the Cyprus Mines Corporation.

Felix E. Wormser, who for the last 17 years has been secretary of the Lead Industries Association, an organization serving the interest of the miners and consumers of lead, has joined the staff of the St. Joseph Lead Co., 250 Park Avenue, New York 17, N. Y., as assistant to the president.



FELIX E. WORMSER

Mr. Wormser was born in Santa Barbara, Calif., on Oct. 31, 1894. He was educated at Stuyvesant High School, New York, and was graduated from Columbia School of Mines in 1916. After leaving college he worked in an Oregon gold mine as mining engineer and surveyor and held a commission from the United States Land Office as United States mineral surveyor. He enlisted in the first World War as a private and was promoted to second lieutenant. Following the first World War Mr. Wormser was with the U. S. Bureau of Mines and then for five years on the editorial staff of *E.&M.J.* He married Miss Elsie Wolff in 1920. They have two daughters. In addition to executive work in the New York office, Mr. Wormser will aid St. Joseph Lead in its operations in both the United States and South America.

ROBERT L. ZIEGFELD

Mr. Wormser's post will be assumed by **Robert L. Ziegfeld,** who has been connected with the Association since 1929 and who became assistant secretary about ten years ago. Mr. Ziegfeld was born in Chicago in 1904. He was graduated in mining engineering from the Sheffield Scientific School, at Yale University, in 1925. After graduation, he was employed as a mining engineer by the New Modderfontein Gold Mining Co., Transvaal, South Africa, and the Oliver Iron Mining Co., Eveleth, Minn. He is member of the American Institute of Mining and Metallurgical Engineers, and official representative of the Lead Industries Association in the American Water Works Association. He is also the author and co-author of several chapters on lead for the new edition of the Metals Handbook, and has written papers on lead for the New England Water Works Association, *Steel,* and for other organizations and publications.

S. M. Manning has joined the engineering staff of South American Development Co. and is now in Ecuador.

Arvid Thunaes has joined the metallurgical staff of the Bureau of Mines at Ottawa. For several years past he has been engaged in tin recovery in Bolivia.

Egil H. Lorntzsen has left Vancouver for Dutch Guiana to inspect progress by Janapow Gold Mines, Ltd., of which he is president.

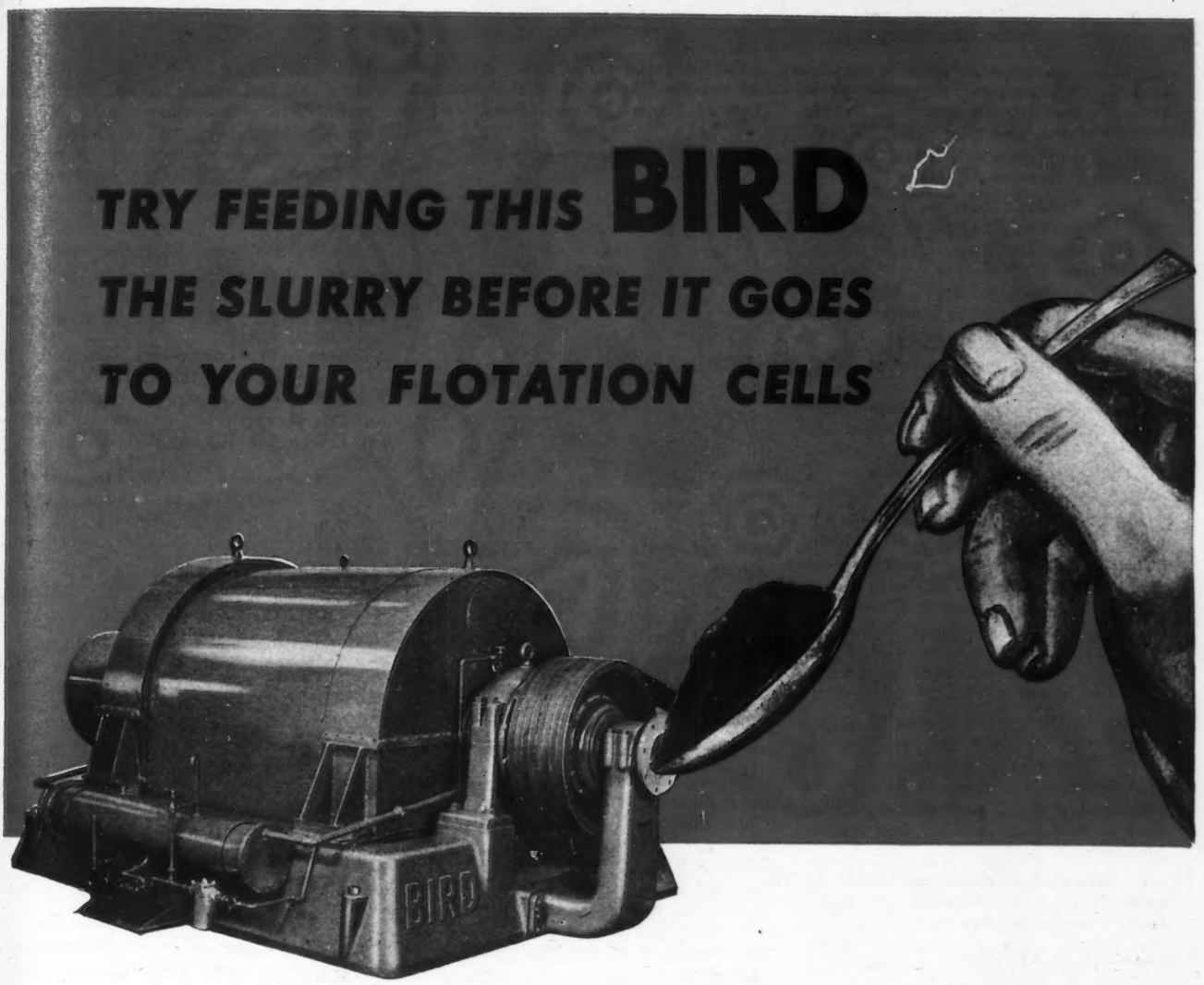
B. R. Armour, chairman of the board of American Potash & Chemical Corporation, recently announced that **Peter Colefax,** executive vice president, has been elected president of the company. Mr. Colefax joined the company in 1935. He succeeds **Frederick Vieweg,** who has resigned after 28 years of service.

R. Cauffman and **B. Pubellier,** of the Aluminum Francais Co., which operates plants near Paris and Lyons, France, inspected the Mead and Trentwood aluminum plants, in Spokane, Wash., on Feb. 1.

A. G. Kirkland, manager of Mic-Mac Mines, Ltd., Quebec, Canada, for the past six years, has been transferred to Salt Lake City as assistant to the manager of Western mines for the United States Smelting, Refining & Mining Co.

M. Clair Smith, of Vale, S. D., has been appointed State Mine Inspector for South Dakota by **Governor Mickelson.** His official headquarters will be in Lead, S. D.

Raymond B. Ladoo announces the discontinuance of his grinding and pigment business, operated as the R. B. Ladoo Co., to devote his entire time to consulting engineering in the industrial, mineral, and chemical fields,



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including market and resource surveys and technologic and economic problems, especially in relation to the Pacific Coast and the Pacific Northwest. His address will be 42 Huntington Road, Newton 58, Mass.

R. G. Sullivan has been appointed general superintendent of the Pine Creek Tungsten Unit, United States Vanadium Corporation, at Bishop, Calif. He succeeds **A. F. Boyd**, who has been transferred to Colorado vanadium and uranium operations.

D. F. Hewett, staff geologist of the United States Geological Survey, is engaged in completing reports on areas in southeastern California and in occasional field trips to manganese districts in the southwest. He will return to Washington about July 1.

R. G. K. Morrison, superintendent of Ooregum Mining Co., in the Kolar gold field of India, who has been spending some weeks in Ontario, will leave Halifax on April 13 by the "Aquitania" for England, where he will stay until some time in May. On leaving England his address will be Oorguam, South India.

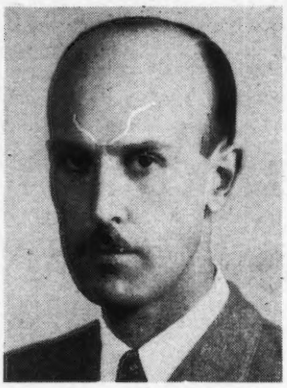
John C. Davey and **Victor M. Lopez** have been awarded the gold medal of the Venezuelan Academy of Natural Sciences "in recognition of their outstanding work in Venezuela in the field of economic geology and mining economics."

C. Maxwell Norman has been appointed the New Goldfields of Venezuela's representative on the board of the recently formed Guyana Mines, Ltd., with headquarters in New York.

Dr. Daniel S. Eppelsheimer has been appointed associate professor of metallurgical engineering at the Missouri School of Mines and Metallurgy, where he will be in charge of instruction and research in ferrous metallurgy and the X-ray examination of metals. Dr. Eppelsheimer was formerly chief physical metallurgist and sales manager of Metal Hybrides Co. He is a graduate of Harvard University and was at one time on the staffs of the Union Carbide and Carbon Research Laboratories and the University of New Hampshire.

DR. D. S. EPPELSHEIMER

Carlos del Solar, mining geologist, has resigned as chief of the technical staff of Banco Minero, Peru, and is now general manager of Ladrillos y Agregados, S.A., a new organization for the production of construction materials. Mr. del Solar is still maintaining his consulting practice. His address is 6 de Agosto, 768, Lima, Peru.



CARLOS DEL SOLAR

OBITUARIES

W. B. D. Motter, Jr., mining engineer, assistant to the vice president of Chile Exploration Co., a subsidiary to Anaconda Copper Mining Co., died on March 18 at Greenwich, Conn., at the age of 63. Mr. Motter had been associated with Guggenheim Brothers and the M. A. Hanna Co. and was a vice president of the Mining and Metallurgical Society of America, president of the Mining Club of New York, and chairman of the committee on ways and means of the A.I.M.E.

Karl J. T. Ekblaw, a former secretary of the American Zinc Institute, author and editor, died at Oak Park, Ill., on March 18, at the age of 61.

Oral J. Berry, 62, of Billings, Mont., for 30 years in government employ as a mining engineer, died recently near Beach, N. D., of a heart attack while driving his auto on official business.

Warren Charles Bracewell, New Mexico State Inspector of Mines for 22 years, died in Hot Springs, N. M., on Feb. 5 at the age of 66.

William F. Staunton, 86, a mining engineer credited with aiding development of many early-day Arizona mines, dies in Los Angeles on Feb. 12.

W. Rowland Cox, a retired mining engineer, died recently at the age of 74. Mr. Cox was a graduate of Denver University and the Missouri School of Mines.

Carlos Whitney Van Law, a mining engineer on the staff of the Vanadium Corporation of America, New York, died at Pelham, N. Y., on Feb. 26, at the age of 72.

Colin Orford, 63, well-known Idaho mining engineer who for many years was associated with the DeLamar mine, at DeLamar, Idaho, and more recently was associated with Morrison-Knudsen company of Boise, died at Wendell, Idaho, recently. A native of Denver, Colo., Orford received his education at Queen's University, Kingston, Canada.

C. T. Madigan, scientist and explorer, died at Adelaide on Jan. 14 last. Dr. Madigan was an authority on the geology of Central Australia.

Henry M. Lancaster, 70, died in Helena, Mont., at the end of January. Mr. Lancaster was a mining engineer and mineral surveyor, recently active in the Corbin-Wickes district.

Sam Goodman, 71, who operated the Beaver Creek mine, in Phillips County, Mont., in the early '30s, died in Los Angeles on Jan. 20. Mr. Goodman also was prominent in Montana mercantile circles during the last 50 years.

Robert J. Smith, 48, assistant superintendent of the Great Falls zinc plant of the Anaconda Copper Mining Co., died in the early part of February. Mr. Smith started to work for the Anaconda company in 1927, and later attended the Montana School of Mines, from which he was graduated in 1933.

Sir John Smith Flett, geologist and author, former director of the Geological Survey of Great Britain and of the Museum of Practical Geology, died in London on Jan. 27 last at the age of 77.

George Blow, a consulting mining engineer of New York, died at New York Hospital on Feb. 17 at the age of 59. He was an alumnus of the Virginia Military Institute and the School of Mines of Columbia University and served in the first World War with the rank of major.

Louis Doremus Huntoon, consulting mining engineer and former professor of mining and metallurgy at Sheffield Scientific School of Yale University, died at Pleasantville, N. Y., on Feb. 22 at the age of 78. He was a member of the Mining and Metallurgical Society of America and of the A.I.M.E.

Andrew Nesbit, a retired mining engineer long identified with domestic and foreign mining development, died in San Leandro, Calif., on Feb. 24 at the age of 73.

John Harland Burns, who had been engaged in the development of alunite deposits in the western areas of the United States for more than a quarter century and in mining in California, Mexico, and Colorado, died in Marysvale, Utah, on Feb. 7 last at the age of 65.

James F. Berry, mining engineer, died in El Paso, Tex., on Feb. 16, at the age of 64. He was for a number of years superintendent of various units of the American Smelting & Refining

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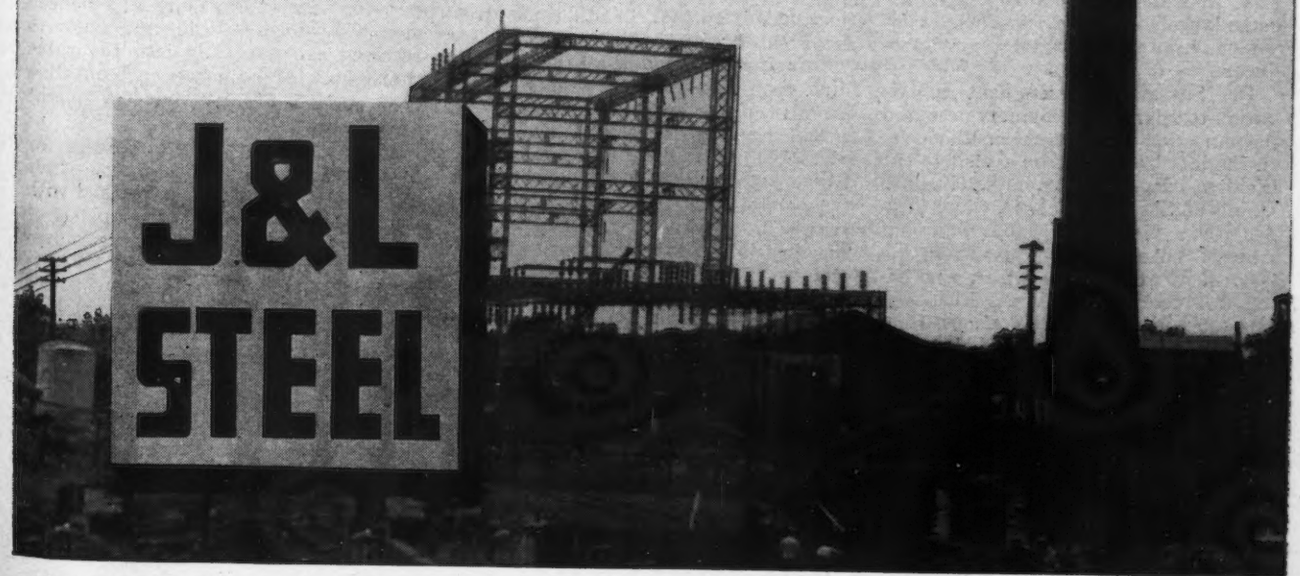

Co. in Mexico and recently was manager of the Moctezuma Copper Co. (Phelps Dodge Corporation) at Nacozari, Sonora.

L. K. Lacey, of San Francisco, died in that city on Feb. 9 last. He had been associated with the American Smelting & Refining Co., of New York, from 1909 to 1944 and was general auditor of that company from 1940 to 1944, when he established his own business as a consulting auditor.

An Appreciation of Dr. Otto Sussman

The mining industry suffered a major loss in the death of Dr. Otto Sussman, chairman of the board of The American Metal Company, Ltd., on Feb. 3, in his 69th year.

Dr. Sussman's technical education was initially obtained in Germany, where he studied at the Royal School of Mines, Clausthal, and there received his degree of mining engineer. His Ph.D. degree was awarded by the University of Wuerzburg, where he continued his studies. Prior to coming to the United States in 1904 he had extensive experience in mine examinations in Algeria, Spain, and Brazil.

Dr. Sussman joined the staff of American Metal Company, Ltd., in February 1904, and until 1910 was stationed in Salt Lake City, when he made examinations of practically every mine of importance in the United States, Mexico, and Canada. Collateral to his work was the development of zinc smelting by the company, which, during World War I, operated zinc smelters in Bartlesville and Collinsville, Okla., and Langeloth, Pa. His mining activities served to secure the necessary flow of ore to these plants and helped the company to become, during World War I, the largest producer in the United States of Prime Western zinc. In Cuba he realized the possibilities of the Matahambre property, in which his company later became largely interested and which developed into an important copper producer.

Dr. Sussman's preeminent contribution to mining development occurred in connection with Northern Rhodesia. In the late '20s, while on a visit to the O'okiep Copper Company, in the Union of South Africa, in which The American Metal Company was and still is substantially interested, he learned of prospecting which was being conducted in Northern Rhodesia. His subsequent visit to Northern Rhodesia and the studies he made there convinced him that a major copper development was in prospect. As a result of his foresight, American Metal became interested first in the development of the Roan Antelope Copper Mines, Ltd., and later in the Mufulira Copper Mines, properties which have turned out to be two of the major copper mines of the world.

Dr. Sussman's career with American Metal coincided with and was in large part responsible for the company's transition from primarily a metal trading company to an operator of mining properties and metallurgical plants in the United States, Mexico, and other foreign countries.

His superior qualifications as a mining engineer were fortunately coupled with an unusual measure of business and administrative judgment which made him the logical head of the company, which he successfully guided through the vicissitudes of the depression of the early '30s. His qualities of leadership were outstanding, and with his death the company, which he was so largely instrumental in building to its present position, as well as the mining industry as a whole, has lost one of its most valued leaders.

NORMAN HICKMAN

A LETTER

Considers Personnel Survey Unrealistic

To the Editor:

Commenting on your article, "Engineers Criticize Mining Industry Personnel Policies," in the January issue of *Engineering and Mining Journal*, I should like to point out some considerations and correct what I conceive to be some misconceptions presented therein. My few years' experience in the mining industry does not make me an authority, but it has left me with some ideas.

The best men are staying in the industry. Some men may be leaving, and some of them may be brilliant men who could aid the industry if they were of a mind to stay with it. However, the fact that they do leave indicates to me that they do not have the interest of the industry at heart in the first place. A man who is engaged in the work of his first choice does not often look to other pastures for greater rewards.

I further contend that the way to lure new men is not primarily by promise of better financial gains but rather through increased advertising of the things that mining offers now. I was attracted by the promise of interesting work, the opportunity to travel in pursuit of that work, and the association with the finest type of men — men who characteristically work with rolled-up sleeves, ready to tackle any problem, big or small, which stands in their path. In short, I was lured by a man's job, and in my first few years, which are supposed to be the hardest, I have not been disappointed.

The relation of an engineer's salary to the current wages of the men working under him is not a problem peculiar to the mining industry—it is presently prevalent in all industries. I agree that such a condition is distasteful, but I think that it pays to look at it broadly and realize that labor-management relationships are in a state of flux and readjustment. To point out that wage differences are unbalanced is a true observation, but getting unduly upset over it ignores the fact of long standing that those who have equipped themselves with a college education and the ability to assume management responsibilities have been amply repaid for their efforts in the long run. Today's great enrollment in our universities by young men preparing themselves for better positions does not seem to indicate a change of philosophy and a resignation to the fact that an hourly-paid laborer gets as much as a college-trained supervisor, anyhow. If our engineers are being comparatively underpaid now, I have seen no proof that this condition will prevail permanently.

It was heartening to note that the percentage favorably inclined toward unionism was quite small. Presumably it might be conjectured that those discontented with their progress to date are the ones who look toward unionism as an answer to their problem, but a good majority of those questioned are satisfied enough so that they would go into mining in spite of its alleged handicaps. This far overshadows the expressions of dissatisfaction they voiced in the other answers. After all, such things as promotions and recognition never come fast enough for a young man who is ambitious and fired with enthusiasm for his profession.

I feel that the returns on your survey should be interpreted far more optimistically than they were, especially when it is considered that the average employment period of seven and one-half years represented by the group submitting answers indicates that the survey pertained chiefly to younger men, who are more likely to become discouraged and have had less opportunity to feel the results of their training than older, more experienced men. Therefore, the collective answers received are naturally less favorable than those of a more representative cross-section of the industry might have been.

It is a healthy state of affairs for an industry to stop and analyze itself occasionally, and being concerned with its future supervisory personnel is of major importance. The mining industry is one for real men, and there is no lack of them. The industry is not perfect, but it certainly does not lack appeal. To say that romance has disappeared from mining is not true. More can be done to assure the industry of a supply of young leaders by putting its problems, its work, and its life before them, than by coaxing them with promises of equal or better money gains than they could get in other industries. WILLIAM D. LORD, JR.

Franklin, N. J., Feb. 22, 1947.

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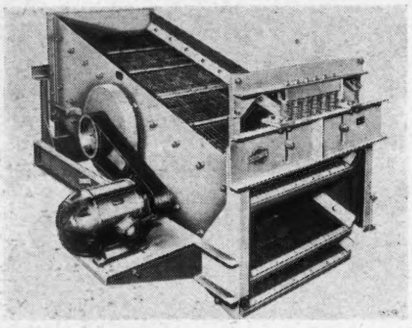
EQUIPMENT NEWS

Heavy-Duty Screen

Telsmith's Vibro-King is a new two-bearing heavy-duty vibrating screen especially designed for finished screening of medium- and small-sized aggregates or ores passing a 3- to 4-in. screen. The company's Pulsator screen is still recommended for scalping service or screening of plus-3-in. sizes.



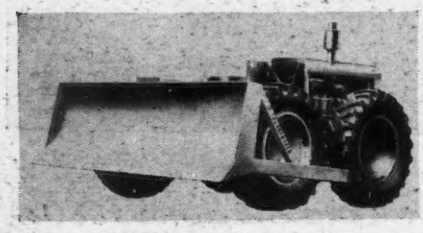
In the Vibro-King, the vibrating unit is mounted in the center of the screen frame on two roller bearings; it is equipped with two counterweights that adjust automatically to smooth out operation. The intense circular motion of the screen is uniform in all parts of the screen cloth on each deck. The vibrating unit is mounted on three nests of springs. Screen mounting is by screen trays or over rubber-covered supports. For full details write to Smith Engineering Works, Milwaukee, Wis.

Bulldozer on Wheels

First machine of its kind in the heavy-equipment industry is the new high-speed, rubber-tired, Tournadozer announced recently by R. G. LeTourneau, Inc., Peoria, Ill. Powered by a 160-hp. diesel engine, this Model C Tournadozer has four speeds forward or reverse and can make up to 18 m.p.h.

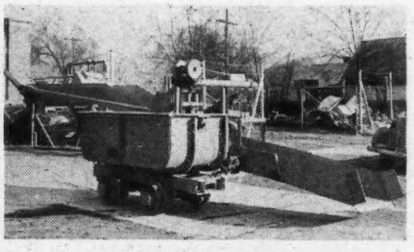
Transmission of the unit is constant-mesh in type, permitting the driver to select any gear ratio without shifting or losing momentum. Steering is by air-actuated disk clutches and brakes controlling the wheels on either side. Bowl is cable-controlled, and the driver has excellent visibility.

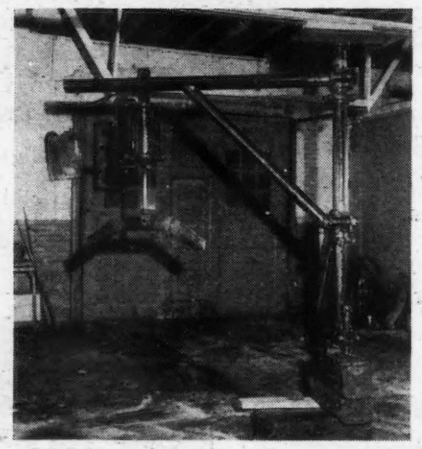
Mounted on four taper-bead 14x32 tires, the unit is smooth riding and low in maintenance cost. It has its greatest usefulness, the manufacturer states, on work requiring maneuverability, such as push-loading of scrapers, clean-up around shovels, and small-yardage stripping. Specifications are: wheelbase, 5 ft. 11§ in.; length, 15 ft. 2 in.; height, 7 ft. 11 in.; width of blade, 11 ft. 3 in.; height of bowl, 44 in.; shipping weight, 14½ tons.



Foam Killer

Anyone who has the problem of killing flotation froths to facilitate subsequent filtration or thickening of concentrate might well investigate a new silicone called Antifoam A, recently announced by Dow-Corning Corporation, Midland, Mich. The substance appears particularly effective on oleate froths, but it is said to work on other foams in aqueous solutions.

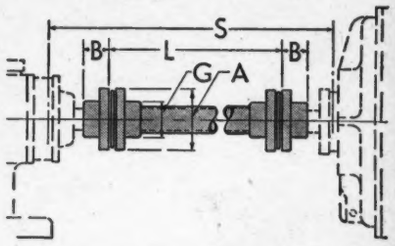




CLEANING DITCHES in tunnel driving is made easier by the special loading machine shown in the top picture. Now in use on a tunnel job at Park City, Utah, the machine uses a scraper running on a ramp that fits into the ditch alongside the main track. The lower picture shows a completed cherry picker made for car handling in tunnel work. Both machines are manufactured by Cate Equipment Co., 49 East Ninth South, Salt Lake City 4, Utah.

Flexible Shaft Couplings

New types of flexible couplings for various applications have been announced by Thomas Flexible Coupling Co., Warren, Pa. The ST coupling, the single type, will take care of misalignment only, and was designed for use principally with outboard bearings. It is designed so that it will support the armature or rotor of motor or generator, thus eliminating one bearing.



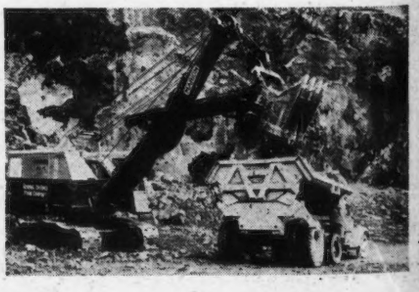
The SN coupling, shown in the drawing, consists of two single couplings connected by an intermediate shaft. It is designed for high-speed drives, for example between motors and gear reducers located some distance apart. Pilot bearings are not needed. Because these couplings are often required to operate in corrosive atmospheres, they can be made up of zinc-plated steel or of stainless steel.

Limited-Input Welder

Designed for use on single-phase power lines of limited capacity, the new Westinghouse general-purpose transformer arc welder is available in three output ratings: 130, 160, and 180 amp. The machine is suitable for farm, mine, or small repair shop use. Full details may be secured from Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

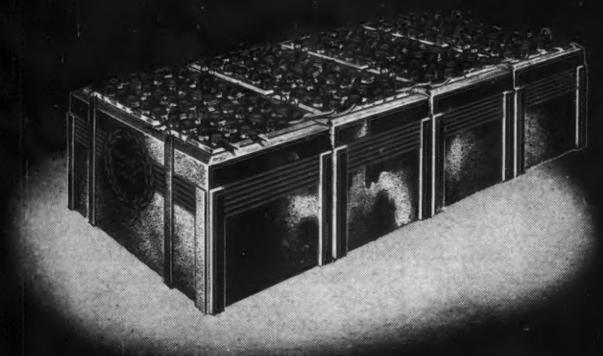
All-Purpose Shovel

Designed especially for work in the mining and quarrying fields, the new Marion 93-M heavy-duty 2½-cu.yd. shovel also operates as a dragline, crane, or clamshell. Features of the



Built for hard work—All day—Everyday

Only operators of **battery powered** *haulage equipment know how dependable, trouble-proof and safe underground haulage can be. Only those who have tried the toughest battery of them all—the Philco "Thirty"—know how much more work a really modern, extra capacity mine battery can do . . . and how much money it saves. Ask a Philco man for the facts. Write for specification data.*



PHILCO

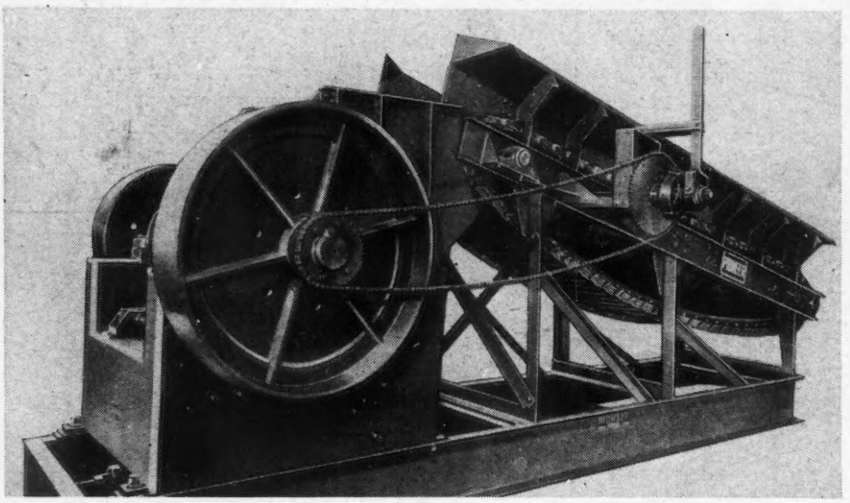
STORAGE BATTERIES

PHILCO CORPORATION • STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY

new machine include: Marion air controls; ease of convertibility; ease of preparation for rail shipment; simplicity of maintenance; rugged construction; and ample power. Varying boom lengths and bucket combinations are available, and a live boom hoist is standard equipment, making the machine particularly adaptable for crane service.

Conveyor Take-Up

A new steel-frame ball bearing take-up for conveyor service has been announced by Dodge Mfg. Co., Mishawaka, Ind. Incorporating the Dodge SC ball-bearing take-up unit, the device has a welded-steel frame and brass adjusting nut. Adjusting screw is cadmium plated.

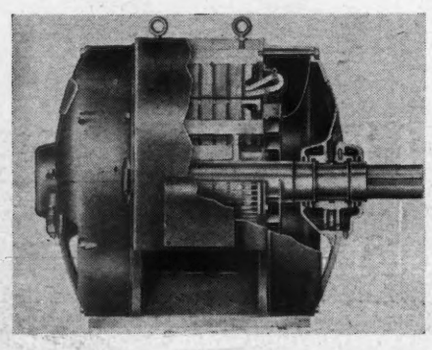


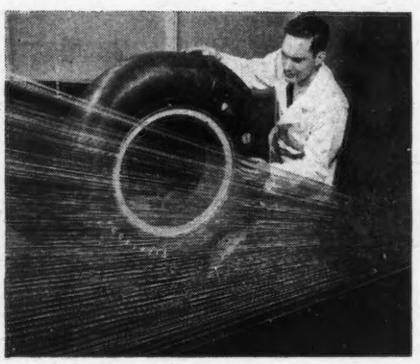
Unit Apron Feeder

Pioneer Engineering Works, Minneapolis 13, Minn., is offering what is said to be a new development in apron feeders, a feeder unit that can easily be installed with a primary crusher for various purposes. Driven from a gear motor, from a conveyor, or from the crusher itself, as shown in the photograph, the feeder provides heavy-duty service with its ½-in. plate forged-steel pans. Four widths up to 48-in. and five lengths up to 14 ft. are understood to be available.

Induction Motors

Heavy-duty squirrel-cage induction motors in sizes from 100 to 1,000 hp. at 1,800 rpm. and lower speeds have been announced by Electric Machinery Mfg. Co., Minneapolis 13, Minn. Designed in drip and splash-proof construction, the new motors have fabricated steel frames that provide simplified cleaning and lubrication. Ventilation is provided by blowers on each end of the frame.





STEEL WIRE is used in building the Firestone Tire & Rubber Co's. new Wire Cord tires, made especially for mine, quarry, and logging-camp use. The photograph shows the wire being fed into the 4-ply fabric construction which replaces the older 12 to 14 plies of rayon or cotton fabric. In field tests, the Wire Cord tires have run double the mileage of conventional types.

Strong Sheave

Two new lines of QD sheaves, featuring improved groove-belt fit and reinforced arm construction, have been announced by Worthington Pump & Machinery Corporation, Harrison, N. J. Designated as the A and B lines, each will provide individual groove size to match belt size. Former A-B combinations are discontinued. The reinforced arm construction of the new sheaves uses a longitudinally ribbed arm resembling an I-beam.

Stainless-Steel Filters

Stainless-steel laboratory filters with porous stainless-steel filter elements are now being manufactured by Micro Metallic Corporation, Brooklyn 7, N. Y., and are available through laboratory supply houses. The line includes filter crucibles, Buchner funnels, gas dispersion tubes, and filter tubes. Five porosities are available. Details of the various advantages of using stainless steel will be furnished by the manufacturer.

INDUSTRIAL NOTES

Guy W. Davis, local sales manager of Canadian Industries, Ltd., at Nelson, B. C., died on Feb. 13. He was well known throughout British Columbia, having represented the company at Vancouver and Prince Rupert previously.

George Gray, of the Vancouver office of Canadian Industries, Ltd., explosives division, has been appointed manager of the company's Nelson, B. C., office, succeeding the late G. W. Davis.

Howard C. Josephson has been appointed general sales manager of **Greene, Tweed & Co.,** North Wales, Pa., which has embarked on a program of expansion.

Mack-International Motor Truck Corporation announces the appointment of **Henry Rowold** as assistant general sales manager.

Ralph D. Holcomb has been appointed general sales manager of **Harnischfeger Corporation,** Milwaukee, Wis.

Floyd Jones is the new sales manager of the portable compressor division of **Davey Compressor Co.,** Kent, Ohio.

George W. Marshall, Jr., has been appointed general sales manager for the asbestos products division of **Raybestos-Manhattan, Inc.,** Chicago, Ill.

Robert A. Neal, vice president of **Westinghouse Electric Corporation,** has been named general manager of the company's Pacific Coast operations.

Sales development activities of the crusher and process machinery division of **Nordberg Manufacturing Co.,** Milwaukee, Wis., will be directed by **Jack D. Grace,** formerly editor of *Excavating Engineer.*

As of Feb. 27, **Bath Iron Works Corporation,** Bath, Me., owns all outstanding stock of **Pennsylvania Crusher Co.,** Philadelphia, Pa. Manufacturing will be concentrated in Bath, but sales and engineering offices will continue at

Broad and Arch Sts., Philadelphia. **W. S. Newell** was elected president of the reorganized company; **G. W. Borton** and **W. A. Battey**, former executives, have retired at their own requests, but will continue as directors.

BULLETINS

Rubber Gloves. Suggestions for getting maximum service are included in the new catalog section on rubber gloves and aprons made by B. F. Goodrich Co., Akron, Ohio.

Engineering Review. Write to Allis-Chalmers Mfg. Co., Milwaukee, Wis., for a copy of company's Engineering Review of 1946. Several developments in the mining field are among the many items discussed.

Splash-Proof Motors. Heavy-duty, splash-proof squirrel-cage induction motors from 100 to 1,000 hp., recently announced by Electric Machinery Mfg. Co., Minneapolis 13, Minn., are described in the company's bulletin 188.

Machinery Mover. The Simplex Util-A-Tool, a device to aid in moving or installing heavy machines, tanks, or beams, is described in Bulletin P&P46 of Templeton Kenly & Co., 1020 South Central Ave., Chicago 44, Ill.

Fans. Industrial fans for ventilation or materials handling are described in Bulletin F-946 of Sprout, Waldron & Co., Muncy, Pa.

Hoists. David Round & Son, Cleveland, Ohio, has just issued a new leaflet on its line of Superior spur-geared hoists in ¼-ton to 20-ton capacity.

Insulating Varnish. A 40-page booklet containing complete technical and application data on G-E insulating varnishes has been issued by General Electric Chemical Department, Pittsfield, Mass.

Steam Turbines. Practical information necessary to proper maintenance of general purpose turbines is contained in a new handbook (B-3747), announced by Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Circuit Breakers. Features of Allis-Chalmers FZO-150 3-pole high voltage, oil-circuit breakers are described in a new 12-page bulletin (71B6421) available from Allis-Chalmers Mfg. Co., 704, Milwaukee 1, Wis.

Self-Supporting Cable. A new 52-page manual on self-supporting electrical cable for power distribution in mining and allied industries is available (Bulletin OK-1033) from Okonite Co., Passaic, N. J.

Packing Rings. Raybestos-Manhattan, Inc., Manheim, Pa., has prepared a new bulletin (A909) describing automatic sealing packing rings.

Auger Drills. Hardsocg hydraulic horizontal and vertical drills for drilling overburden are described in a new bulletin of Hardsocg Mfg. Co., Ottumwa, Iowa.

Pumps. Hazleton Type CT sludge pumps for acid or highly abrasive materials are described in a new bulletin of Barrett Haentjens & Co., Hazleton, Pa.

Oil Filters. The standard line of oil filters produced by Briggs Clarifier Co., Bethesda 14, Md., is described in a new booklet.

Flame Cutting. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., have issued a new bulletin which describes their facilities for flame cutting plain and intricate shapes from steel plates.

Cutting Tools. Because the company produces all three groups of cutting materials, Allegheny-Ludlum Steel Corporation, 2020 Oliver Bldg., Pittsburgh, Pa., is able to prepare an impartial analysis of the relative merits of high-speed steels, cast alloys, and carbides as cutting tools, the subject of a new bulletin available on request.

Refrigeration. Ready-Power refrigeration units, using gasoline, gas, or diesel engines, are described in a bulletin of Ready-Power Co., 11231 Freud Ave., Detroit 14, Mich.

Industrial Trucks. Industrial trucks and cranes, of the in-plant load-carrying type, are completely described in a new catalog of Elwell-Parker Electric Co., Cleveland, Ohio.

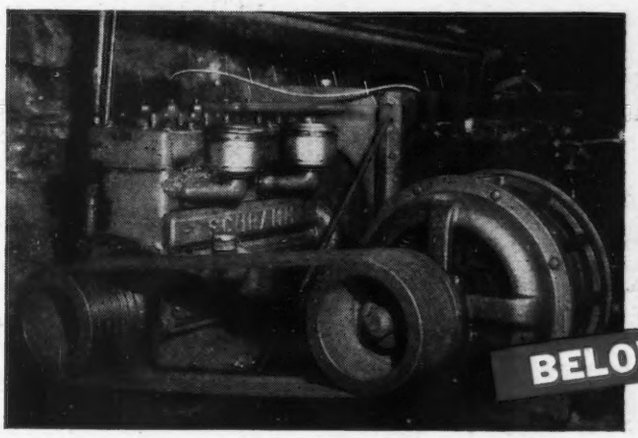
Apron Feeders. Complete specifications on 69 various models and sizes of apron feeders for mine or quarry are given in Bulletin No. 563, recently published by Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

SCHRAMM

PACKAGED AIR FOR THE MINING INDUSTRIES

AT THE SURFACE OR..

Mining Engineers want ruggedness and dependability in an air compressor, portable or stationary . . . at the surface or down in the shaft. That's exactly what Schramm provides . . . plus four special features built into every Schramm Air Compressor: 1. 100% Watercooled, 2. Compact—Lightweight, 3. Mechanical intake valve, and 4. Forced feed lubrication.



BELOW

Write today for performance and construction details on these rugged, dependable units. We believe Schramm compressed-air-power will help make your mining operations easier.

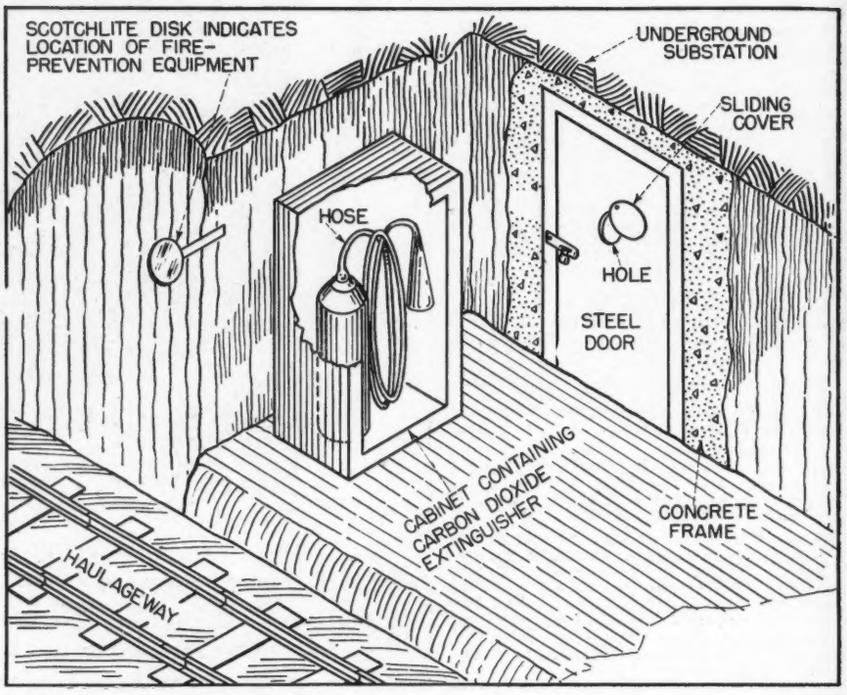
SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

OPERATING IDEAS

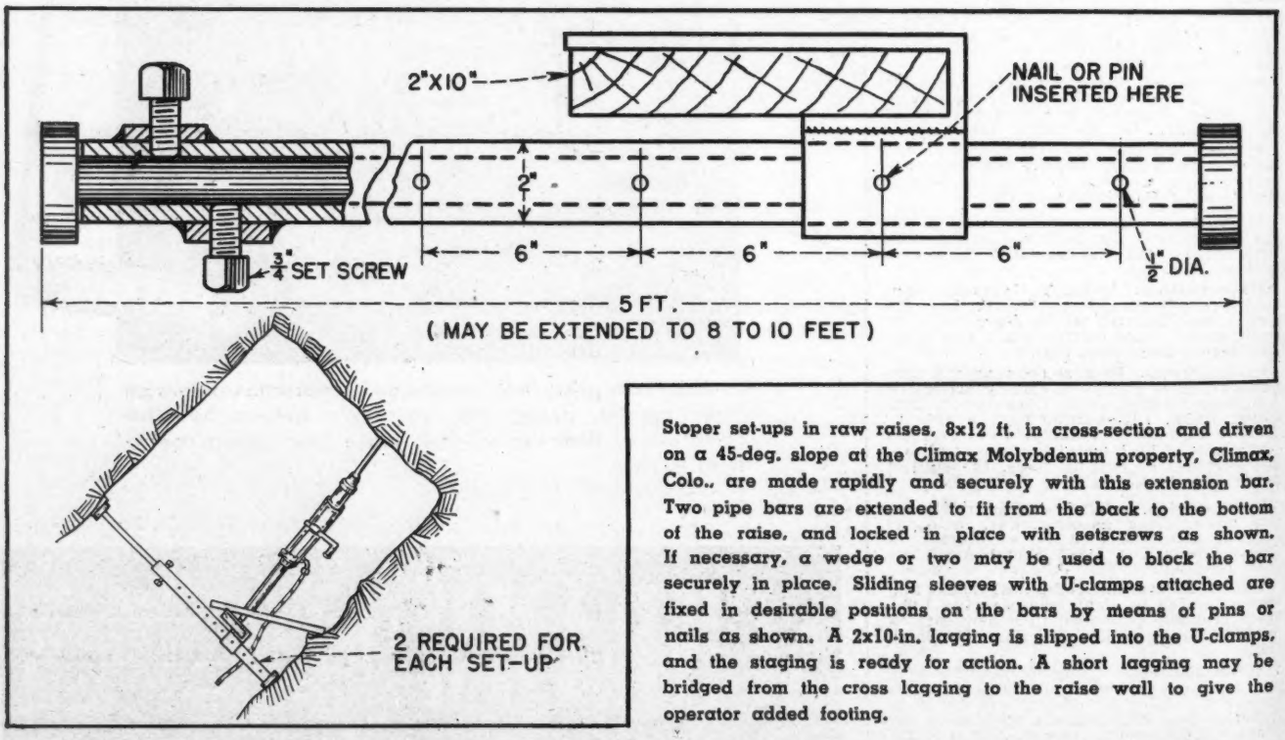
Fire-Fighting Equipment Guards Substation

This arrangement of fire-prevention equipment at underground switch stations and substations at the Climax Molybdenum Co., Climax, Colo., has some unusual advantages. If a fire should break out in the electrical switch station housed behind the steel door with concrete frame, the funnel of the standard carbon-dioxide extinguisher may be removed from the cabinet shown and inserted into a hole in the steel door. Any workman who happens to pass by may bring the fire under control, and yet the station may be locked to prevent possible injury to loiterers.

The orange Scotchlite disk reflector in the haulageway notifies workers that fire prevention equipment is available at that station. These symbols are used to mark the position of fire-fighting equipment all over the mine. Carbon-dioxide-type extinguishers are used because the gas evolved is a non-conductor of electricity.



Extension Bar Forms Stoper Staging



Stoper set-ups in raw raises, 8x12 ft. in cross-section and driven on a 45-deg. slope at the Climax Molybdenum property, Climax, Colo., are made rapidly and securely with this extension bar. Two pipe bars are extended to fit from the back to the bottom of the raise, and locked in place with setscrews as shown. If necessary, a wedge or two may be used to block the bar securely in place. Sliding sleeves with U-clamps attached are fixed in desirable positions on the bars by means of pins or nails as shown. A 2x10-in. lagging is slipped into the U-clamps, and the staging is ready for action. A short lagging may be bridged from the cross lagging to the raise wall to give the operator added footing.

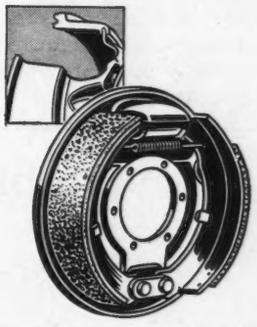
"THINK they last longer? Mister, I KNOW

FORD TRUCKS LAST LONGER!"

That's what Mr. R. G. Colvert of Ardmore, Oklahoma, wrote recently. "One of our Ford Trucks 11 years old," he added, "has gone over 250,000 miles and it's still on the job, with lots of good miles in it!"

ONE big reason—FORD BRAKES STAND UP!

The wide, heavy, cast drum surfaces of Ford Brakes are non-warping and score-resistant. They are interlocked and fused with steel drum discs during casting, providing great strength and reducing weight. The two shoes are independently anchored, each shoe being actuated by its own hydraulic piston. Adjustment is extremely simple and entirely external. Brakes are exceptionally stable in adjustment. Entry of water and dust is minimized by closely fitted tongue-and-groove design, where edges of drums meet backing plates. Ford brake design promotes long lining life, consistent performance, extra-safe stopping ability and easy pedal pressure.



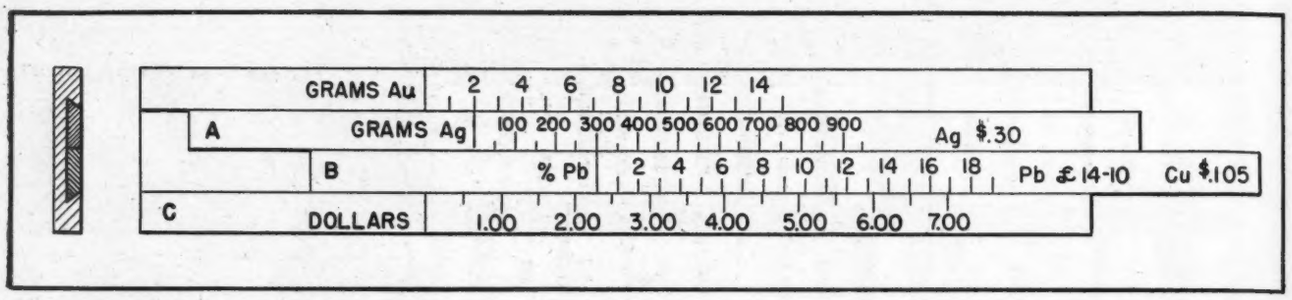
Ford

Bulk construction materials hauling is a field where Ford Truck stamina pays off in long life and low-cost maintenance. This heavy duty Ford Truck is equipped with a Fabco Dual Drive unit and a 6- to 8-yard dump body and hydraulic hoist by Anthony Co., Streator, Illinois.

ONLY FORD GIVES YOU *ALL* THESE LONG-LIFE FEATURES: Your pick of power—the great V-8 or the brilliant Ford Six—extra-strength frames, with siderails *doubled* in heavy duty models—new Flightlight, 4-ring, oil-saving pistons—full-floating and ¾-floating axles, with axle shafts free of weight-load . . . more than fifty such endurance-engineering features in all. It's because of this long-life construction that *of all trucks 14 years old or older on the road today, there are more Ford Trucks than all other makes combined!* More than 100 body-chassis combinations to choose from. Ask your Ford Dealer to show you!

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE!

Simple Slide Rule for Ore Evaluation



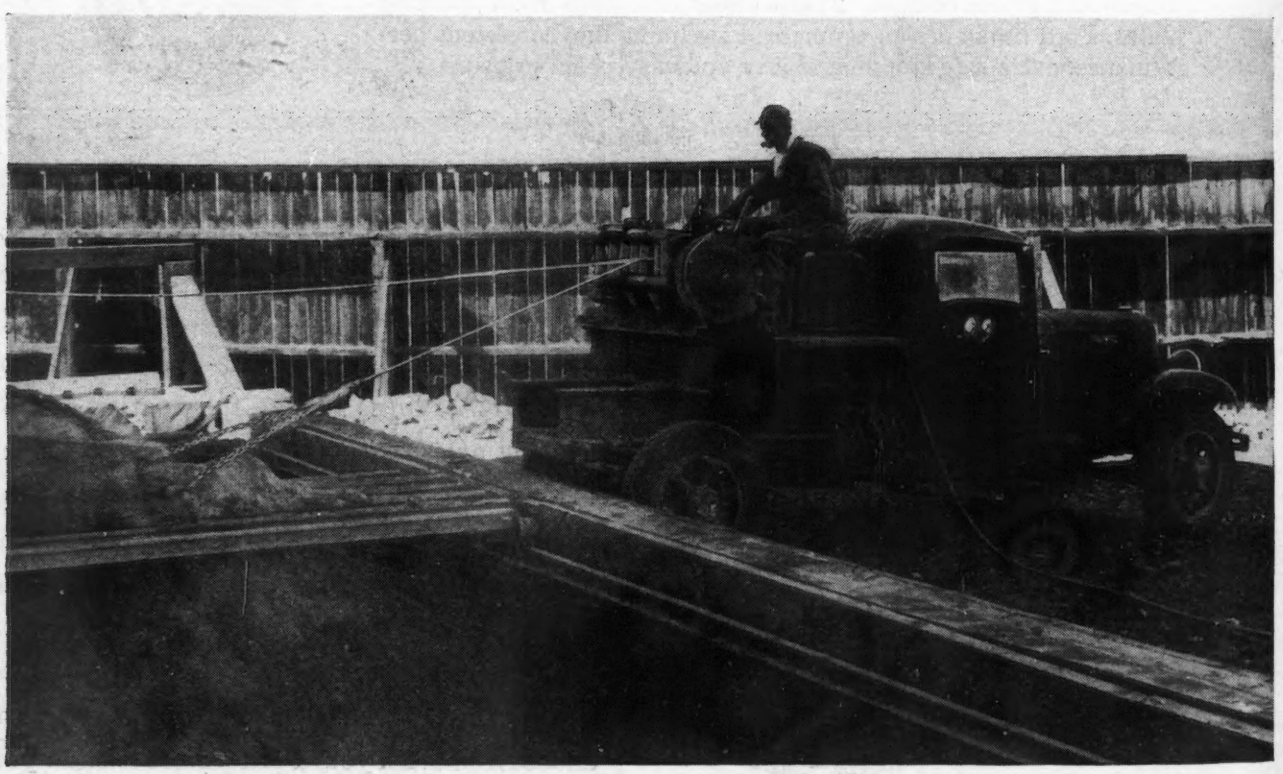
The value of ore containing three metals can be determined rapidly with this simple slide rule described by A. F. Horle of the El Paso office of The American Smelting & Refining Co. Devised at the company's Parral Unit, Chihuahua, Mexico, the first rule was made for the determination of a gold-silver-lead ore containing copper in nearly fixed proportion to the lead. Replaceable slides were made for varying metal prices. A greater number of slides could be used for more components if some method could be devised to hold the slides in place. The numbers are scratched into the wood, or may be impressed with old typewriter type bars. The impression is then colored with India ink.

The rule actually adds the values of the components. In the accompanying illustration the rule is set for an ore containing 2.0 g. gold, 300 g. silver, and 6.0 percent lead. The zero of slide A is placed below the grade of gold. Then the zero of slide B is placed below the grade of silver. Finally the total value, $4 per ton, is read on the scale C below the grade of lead.

To design a similar rule, select some scale ratio as one inch to the dollar. Then construct the division per unit on the scale for each component the same number of inches as the value of the unit is in dollars. The unit should be calculated by deducting tailings losses, direct taxes, freight, and smelter charges on the ore, or on the concentrate produced from the ore.

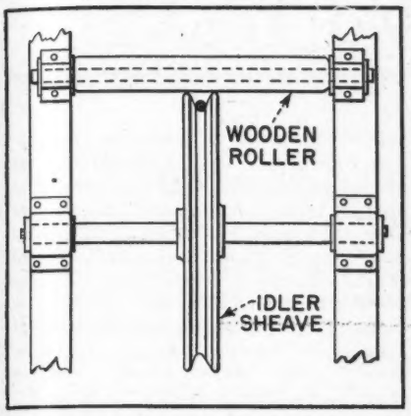
Note that the slide for percent Pb shows the prevailing prices for Pb and Cu because these two metals are present in the ore in nearly fixed proportions.

Portable Tugger Cuts Smelter Labor Costs



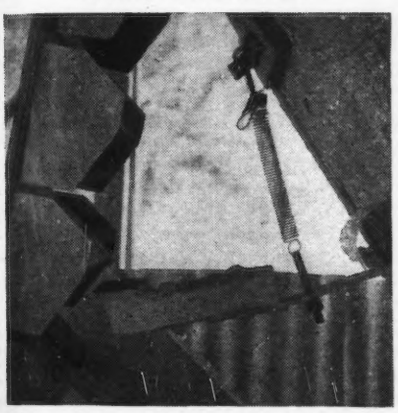
Dust collecting rooms are cleaned out quickly with this two-drum, electric tugger hoist mounted on a truck. With this equipment, two men can now do the same work in two or three hours that seven or eight men did formerly in eight hours with shovels.

Roller Keeps Rope In Idler Sheave



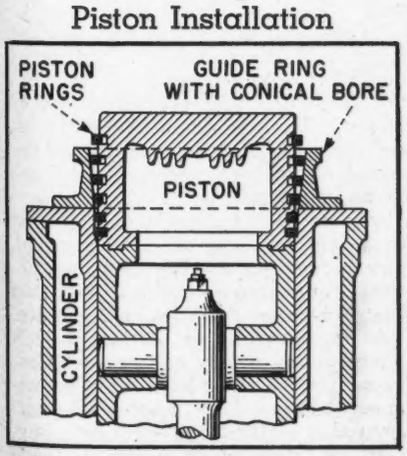
A wooden roller was mounted over the idler sheave at a Central Mexican gold-silver property as shown to prevent the rope from jumping the sheave.

Knocker Cleans Elevator Buckets



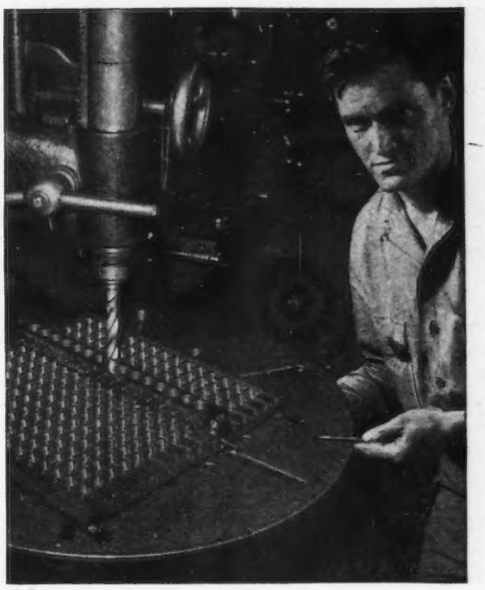
Wing Lew, mill superintendent at a base metal property in Argentina, devised this knocker which jars sticky material from the buckets of an elevator in the mill.

Guide Rings Aid Piston Installation



A steel ring with conical bore as shown above, simplifies the insertion of a piston fitted with new rings into the cylinder of equipment in mine power plants. The slope of the bore of the guide ring is approximately 3 in. per ft.

40% Less Machining with **E-Z-CUT PLATES**



. . . in Stock for Immediate Shipment

Especially well suited for die bases, jigs, and other applications where considerable machining is involved, E-Z-Cut plates machine smoothly at higher speeds, with less tool wear. Other E-Z-Cut advantages: They case harden to extreme surface hardness with even gradation of carbon from case to core. Weld easily. To save with E-Z-Cut, call, wire or write the nearest Ryerson plant for quick service.

JOSEPH T. RYERSON & SON, INC., Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston, Los Angeles.

Bars • Structurals • Plates • Sheets
Mechanical Tubing • Boiler Tubes
Allegheny Stainless • Alloys • Tool Steel
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RYERSON STEEL

Unique Advantages
in Canada's Famous
BBS-2 SURFACE DIAMOND DRILL
Here is the world's most versatile surface diamond drill. Its rugged construction and high speed motor have been thoroughly tested under every possible operating condition. Newly developed combination gear and friction feed swivelhead permits greatly improved control. Other interchangeable swivelheads provide screw, hydraulic or friction feed suitable for every formation. Model BBS-2 drills a wide range of diameters—handles rods, casings, pipes in various combinations—can be equipped with auxiliary hoist for bailing. Its capacity: 2000 feet with "E" rods—1800 feet with "A" rods.
Write for bulletins describing our complete range of field-tested underground and surface drills and Ready-Set cast bits. Special care assumed in handling and shipping all export orders.
WE LOOK INTO THE EARTH
BOYLES BROS. DRILLING CO. LTD.
DIAMOND DRILLING CONTRACTORS AND MANUFACTURERS
VANCOUVER, B.C.

NEW BOOKS

RARER METALS. By Jack De Ment and H. C. Dake. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Pp. 392. Price $7.50.

The increasing use of, and interest in, the so-called rare metals is reflected in the production of this book, which is a compendium of information on the mineralogy, metallurgy, and chemistry of 23 of these metals. Included are such metals as gallium, beryllium, selenium, uranium, molybdenum, and the groups of silicon, vanadium, and platinum. Anyone who wishes a reference work carrying unusually complete data on such metals will find it here.

THE PHILIPPINE GEOLOGIST. Vol. I, No. 1, December 1946; Journal of the Geological Society of the Philippines; Published by the society at Manila, P.I.; Pp. 36.

This society journal undertakes to satisfy the desire to promote "a wider knowledge of Philippine Geology," consolidate published material on the same, and provide "a local vehicle in which our geologists and engineers may expound their pet theories and ideas on local geologic problems." At present it is in mimeographed form. No. 1 contains "Geological Studies in the Philippines"; "The Surigao Iron Ore and Its Metallurgical Treatment"; "The Role of the Geologist in Industrialization"; "The Microfossils of the Philippines"; and a news section.

AN ECONOMIC SURVEY OF THE MINING INDUSTRY IN NORTHWESTERN QUEBEC. By Dr. E. F. Beach and Dr. B. H. Higgins, McGill University; Dr. O. J. Firestone, Director of Economic Research, Department of Reconstruction and Supply, Ottawa. Published by Mines and Natural Resources Section, Board of Trade, Montreal, Canada. Pp. 70. Price $10.

The mining industry as a field of employment and as a market for equipment and services is considered in this authentic study by Canadian economists. New industrial developments, new services, and developments in a major field that has gained national importance within the past 20 years have been approached with the purpose of demonstrating a major field for postwar employment. Started in 1942, this study considers the administrative machinery needed in developing the great areas that lie north of the old settled districts of eastern Canada. "In the exploitation of this Canadian frontier for the benefit of the nation as a whole," the authors conclude that long-range planning for regional development must be based on detailed studies that will consider not only the basic mining industry but other resources that also may be developed as important facts of national wealth.

Chapters cover mining as a field of employment; the mining industry as a market for equipment, machinery, processing supplies, and services; the mining industry and regional development; and the outlook for gold. A series of 20 statistical tables present special compilations of material from various sources, giving figures in some cases through 1945. The close study given economic aspects of postwar industry in Canada, with particular attention to Quebec, indicates practical steps that should guide the northward advance of population.

ELEMENTS OF MINING. New Fourth Edition. George J. Young, formerly Western Editor, *Engineering and Mining Journal.* Published by McGraw-Hill Book Co., Inc., 330 West 42d St., New York 18, N. Y. Pp. 755. Price $6.50.

References to the "Monroe effect" in secondary blasting, blast-hole diamond drilling, diesel locomotives underground, and a variety of burn cuts are evidence that Mr. Young's fourth edition has kept apace with the accelerated progress of mining during the past 16 years. (The previous edition was published in 1932.) The text covers underground, open-pit, and alluvial mining. Coal mining is again included, and this is fortunate because of the current trend of some metal and nonmetallic mines to adopt such coal-mining equipment as shuttle cars, shaker conveyors, and electrically operated auger drills.

At the outset the student or reader is impressed with the fact that mining is primarily a business. Such topics as tenor of ores, smelter schedules, and average metal prices set the stage in the first chapter. Thereafter as various phases of mining technology are discussed, the author encourages a sense of "cost consciousness" by persistent citation of such data as cost per foot of diamond drilling, powder consumption per cubic foot, tons scraped per manshift, ventilation costs per ton, etc. This phase of the text culminates in a chapter on mine operation and organization and another on mine valuation, which fortunately dispenses with the ramified formulas of high finance. Nevertheless, the concept of present value of a mining property is demonstrated with adequate clarity.

Recognizing the importance of mechanization in modern mining, the author treats it liberally. Numerous line drawings, halftones, and up-to-date specification and performance charts augment descriptions of diamond drills and bits, rock drills, detachable bits, drill jumbos, mechanical shovels and loaders, pumps, axial-flow fans, mine locomotives, electric shovels, tractor-drawn scrapers, dredges, draglines, trucks, shaker conveyors, and belts. Modern developments in explosives and blasting technique are also covered.

Conventional chapters on exploration and geophysics, phases of mining practice, mining methods, etc., are concise. However, readers who wish to supplement the broad foundation established by this text will find a generous bibliography at the end of each chapter. A. W. K.

A NATIONAL LABOR POLICY. By Harold W. Metz and Meyer Jacobstein. Published by The Brookings Institution, Washington 6, D. C. Pp. 161.

Early last year, The Brookings Institution published a book by Mr. Metz, senior author of the present work, on the labor policy of the Federal Government. (For a review, see *E.&M.J.*, April 1946, p. 120.) Now Mr. Metz and Mr. Jacobstein have prepared an estimate of what, in their opinion, the Government's labor policy ought to be.

They show here how the policies of recent years, by concentrating on increasing labor's bargaining power, have begun to threaten the welfare of the nation as a whole. As they point out:

"The result of this has been to place labor and labor leaders in a position of dominant economic and political importance; and that the settlement of almost all major disputes has, in recent years, been transferred from the realm of private negotiation to the arena of national politics."

The authors' suggestions as to what to do about it are undeniably sound, but on some points they seem impractical. For example, they say flatly that the closed shop ought to be forbidden. Perhaps it ought to be, but it isn't likely to be—not by our present Congress. On the other hand, they recommend outlawing "featherbedding," sympathy strikes, and secondary boycotts, a step which seems to have more chance of success. In any event, we recommend unhesitatingly a reading of this book by anyone who is at all interested in what our national labor policy is at the present time and what it ought to be. R. H. R.

REGIONAL NEWS

COLORADO

Old Caribou silver mine to be opened by long adit—Ventures tests Stratton Estate holdings

★During 1946 the U. S. Bureau of Mines completed investigations of 40 shafts and workings accessible from these shafts in the Leadville area. The program is part of the Leadville Ores project of the Bureau set up originally to estimate the extent of manganosiderite reserves and to obtain representative metallurgical samples of these and other types of complex ores. It is expected that data obtained from mapping the underground geology will indicate likely areas for diamond drilling. Norman Duff Ebbley, Jr., project engineer for the Bureau, stated that it is hoped funds will be appropriated to extend the Leadville deep-mines drainage tunnel another 2,000 to 2,500 ft.

★Resurrection Mining Co., jointly owned by the Hecla, Newmont, and U. S. Smelting companies, continued to operate steadily throughout 1946. More than 200 men are on the payroll. The company produced and milled 65,000 tons of lead-zinc ore and in addition milled more than 35,000 tons of custom ore in its mill in California Gulch. Custom ore shippers included: Buckskin Joe Mines, Ltd.; Max Bunker; Garvie London Gold Mining Co.; Hamm Mining & Milling, Ltd.; Harrison Croesus Mining Co.; M. J. Krolicki; McCaughan & Co.; New Monarch Lease; Niagara Mines, Ltd.; Reynolds Young Lease; Rogers Mines, Inc.; Harry Sundstrom; and Wilfley Leasing Co. M. E. Newlove is general manager. The company is planning to accelerate exploration for new orebodies.

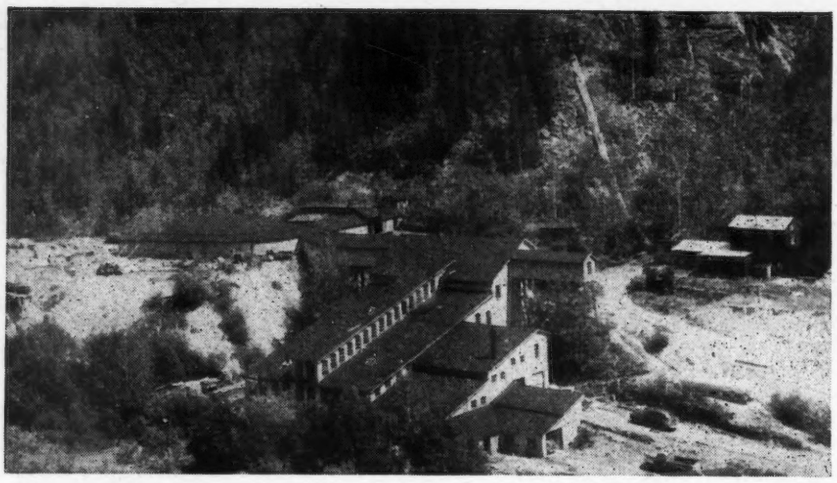
★New developments are under way in the famous old Caribou silver district in Boulder County. Consolidated Caribou Silver Mines, Inc., has been organized to extend the old Idaho tunnel from its present face, at 1,500 ft., an additional 2,000 ft., to tap the Caribou mine between the 600-ft. and 700-ft. levels. The purpose of entering the workings through this lower tunnel is to provide a portal below the region of deeper snows, where it is impossible to keep a road open in the winter. Modern machinery has been installed. When the first round of shots was fired in the tunnel heading it was heard in Rockefeller Center, New York City, 1,800 miles away. By a carefully timed telephone hookup, the sounds of the drilling and blasting were picked up at the drilling face and carried to loud-speakers in the meeting room of the company members. The intention is to drive the 2,000-ft. tunnel to the Caribou shaft as rapidly as possible. It is hoped to complete the 2,000-ft. drive within six months. The Caribou shaft is 1,040 ft. deep.

★Testing of surface ore showings on the Stratton Estate holdings, at Cripple Creek, has been in progress for some months. The properties comprise about 600 acres of mineral land, including the Globe Hill and Ironclad Hill mines, where Stratton was sinking the deep Deerhorn shaft at the time of his death. He is said to have remarked that at great depth in this shaft he expected to strike rich ore. The extensive sampling of the properties has included diamond drilling. More than 1,000 tests have been made, it is reported. The investigating group may lease part of the ground for a larger program. The operating company is a subsidiary of Ventures, Ltd., of Canada.

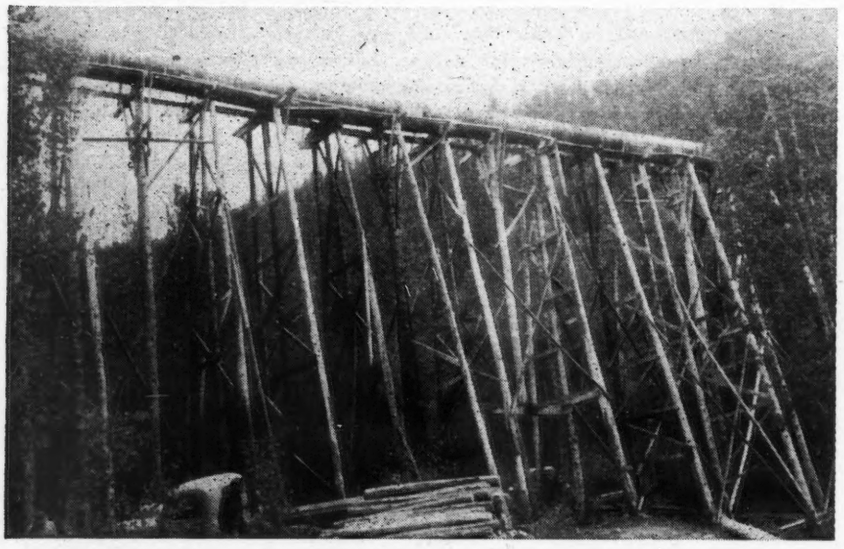
★The Arkansas Valley smelter of the American Smelting & Refining Co. expects to continue on a five-day week schedule in 1947. The payroll now totals 250 employees. Local shippers, including the Leadville milling unit, Resurrection, New Monarch, Dolly B, and Valley mines, continue trucking ore to the Arkansas Valley plant. The Silverton, Telluride, Rico, Idaho Springs, and Aspen districts also continue ore shipments. A change in the method of shipping lead bullion has been made to ease han-

SILVER BELL MINES CO., at Ophir, Colo., is a new producer of gold-silver-lead-copper ore. The conveyor gallery at lower right delivers bulk concentrates to railroad cars from the new 150-ton flotation mill. E. H. Sanders is manager, Clifford Wilfley is consulting engineer, and A. A. Smith is general superintendent. *E.&M.J.* Staff Photo.

COLORADO FLUORSPAR MINES, INC., Brown's Canyon, Colo., is a leading producer of ceramic-grade fluorspar. The muck pile near the shaft is from a shaft-sinking campaign to a depth of 265 ft. conducted last summer. Roy H. Hickman is superintendent.



CARTER MINES, INC., near Ohio City, Colo., is another gold producer which has been revived following a shutdown by L-208. The remodeled mill is equipped with a new 150-ton ball mill. A new 250-hp. diesel engine supplements the mine power supply generated by Pelton wheels from water supply by ¾-mile flume shown below. Ray McDonald is superintendent. *E.&M.J.* Staff Photo.



THREE-FOOT WOOD-STAVE FLUME on stilts carries water to operate compressors and generator at property of Carter Mines, Inc.

LEADVILLE DRAINAGE TUNNEL delivering approximately 2,200 g.p.m. Most of the water comes from a section near the face of the tunnel. It is hoped that funds will be appropriated to drive the tunnel another 2,000 to 2,500 ft. *E.&M.J.* Staff Photo.

Colorado (*continued*)

dling, and the bullion is now shipped out in 9-ton pigs instead of the former 100-lb. pigs. Leo Hennebach is superintendent of the plant, with T. P. Fahey and M. D. Rood as assistant superintendents.

★ A steady expansion of operations at the Climax Molybdenum Corporation property was indicated during 1946. The foresight of the company is shown in the stress laid on underground development work, which was greatly retarded during wartime. A survey shows 260 million tons of proven and probable ore reserves, containing 800,000 tons of recoverable molybdenum. Production of the mine averages about 6,000 tons a day which is below prewar level. Wartime production reached as high as 20,000 tons of ore daily.

★ The Anglo Saxon mine, at Georgetown, will join the list of Colorado ore shippers during 1947. The company reports 130 ft. of drifting in ore averaging two to five feet in width, with assays running up to 191 oz. silver per ton. The drift face was said to be still in ore four feet wide.

★ One of the most significant development programs in recent Colorado mining history has attained its first objective at the famous Black Bear mining property, in the San Juan area. The Black Bear mine was opened years ago by a shaft situated above timberline, where winter snowslides constantly menaced operations. Idarado Mining Co., a Newmont subsidiary, has completed development work to make the lead-copper-zinc orebodies accessible from the Ouray side of the range through the Treasury tunnel. The tunnel had been extended some 5,000 ft. westward toward the downward extension of the Black Bear vein when the Idarado company took over. An additional drive of 7,000 ft. was completed to the vein and a raise carried up 1,100 ft. to the bottom of the Black Bear shaft workings. Fred Wise, general manager, reports it will require some time to put the old workings in condition for mining.

★ Dolores County ranked fourth among Colorado counties in the output of lead and zinc and sixth in the production of silver and copper in 1946. Rico Argentine Mining Co., one of the major zinc-lead-silver producers in the State in 1946, operated its group of mines and 135-ton selective-flotation mill continuously. Markey Bros. worked the Yellow Jacket group under lease from the Rico Argentine company, which was by far the largest operator in the county.

★ A program of building and improving roads to mines in the Alma-Fairplay district, carried out by Park County during 1946, should result in the opening of more mines in 1947. The upper South Platte River gulch, west from Montgomery and Buckskin

Gulch, received the major improvement. The upper South Platte has long needed a road to make the mines of this section accessible to motor trucks. Among the mines which may become active in 1947 are the Wheeler, at Wheeler Lake; the big Highland Princess group on the western slope of Mt. Lincoln; and the Tracks End-Golden Star group, near Mt. Democrat.

ARIZONA

Shattuck Denn negotiates sale of Denn mine — New group buys United Verde Extension

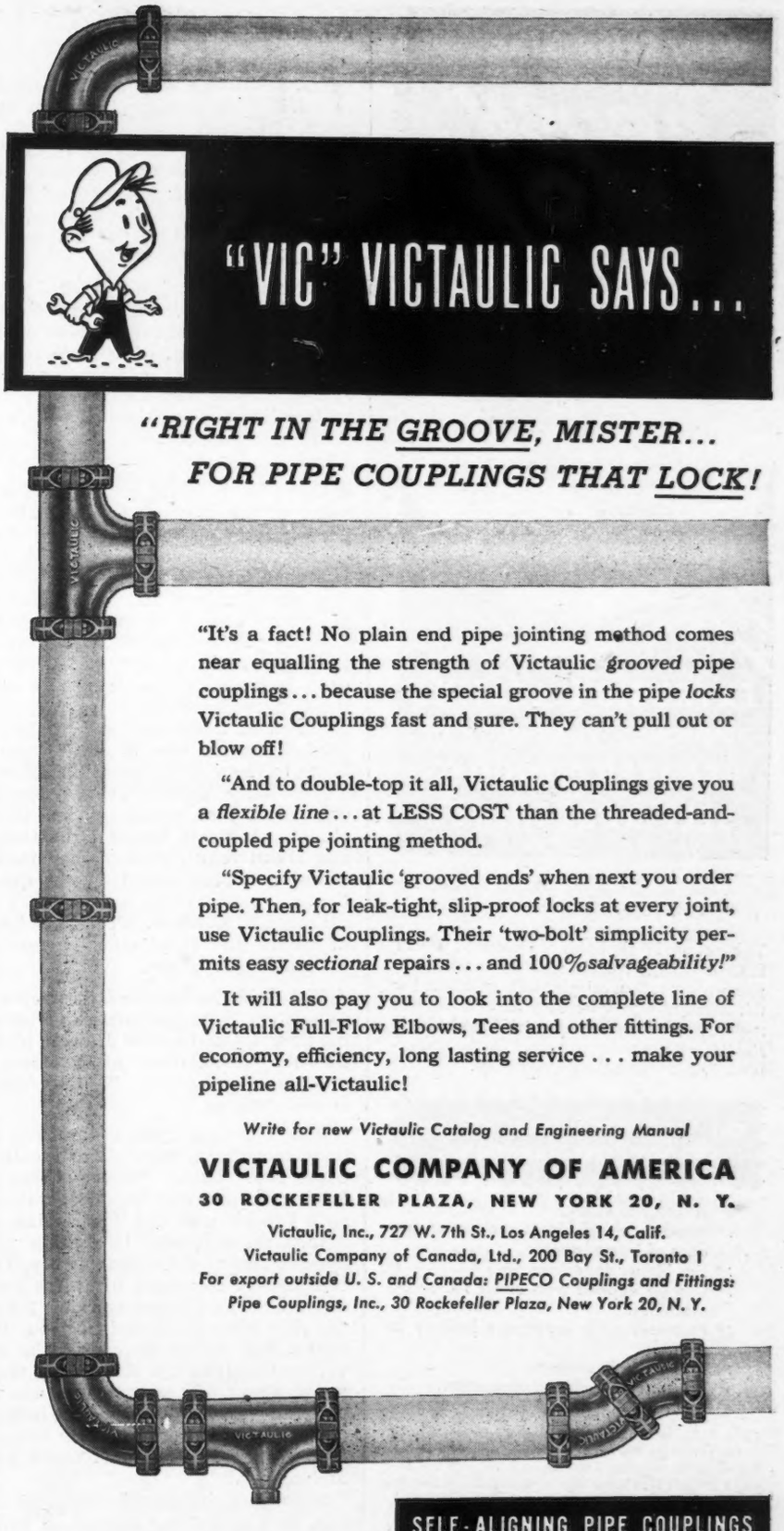
★ Stockholders of the Shattuck Denn Mining Company were to meet at Bisbee March 7 to consider the sale of their Denn mine, near Bisbee, to Phelps Dodge Corporation. The Denn adjoins Phelps Dodge's Copper Queen mine. Terms are reported to call for $300,000 in cash in addition to payments on ore recovered from the Denn in excess of the first 100,000 tons. The mine has been shut down since March 1946.

Shattuck Denn would retain its concentrating mill at Bisbee, where it treats lead, zinc, and copper ores from company properties and other mines. The Iron King mine, near Prescott, has been Shattuck Denn's principal working property since its purchase in 1942. It is being enlarged to a daily capacity of approximately 400 tons of ore. Primarily a producer of lead and zinc, it also yields some gold and silver, and small quantities of copper.

★ The remaining assets of United Verde Extension Mining Co. were sold on Feb. 20 by a vote of the shareholders of the Clemenceau Mining Corporation. The price paid was $105,000. United Verde Extension project was organized by James S. Douglas and George E. Tenney, and is said to have produced more than $132,000,000 in copper. The Clemenceau Mining Corporation took over the property ten years ago to liquidate its assets.

The latest company to take over the property is one of small capitalization which plans to explore the old workings in the hope of finding workable orebodies.

★ Recent publication of the articles of incorporation of Anaconda Copper Mining Co. of Montana has renewed talk of pending large mining developments in the Miami area. Several months ago Anaconda entered into an agreement with Van Dyke Copper Co. for a lease and option to buy its property for $5,000,000, of which $160,000 was to be paid in the first year, and $125,000 in each of the next three years, after which payments were to be increased to $250,000 annually. At the end of five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Arizona *(continued)*

years, $500,000 a year was to be paid in addition to royalty based on the price of copper.

The Van Dyke property is extensive and is believed to contain substantial copper ore. The property was closed during the depression but operated for a time during the second World War.

★ Permission has been granted Empire Copper Co. to issue 600,000 shares of stock at a par value of $1 per share to a list of selected investors. Neil Stewart, of Douglas, presented the request. Among the investors listed are Rudy Vallee, Frank Sinatra, Dick Powell, and Harold Lloyd.

★ Cornelius F. Kelly, chairman of the board of directors of Anaconda Copper Mining Co., declared recently to Arizona mining authorities that the United States is facing a critical shortage of copper, and "if it is unable to import copper in sufficient quantities to augment the depleted domestic supply, the country's industrial basis is due for a shake-up." He said the Congressional action on proposed abolition of the 4c.-a-pound tariff on foreign copper was of vital importance to the nation's economic future.

Mr. Kelly asserted that consumers, rather than producers, had initiated the move to suspend the tariff, and added that Anaconda had maintained a neutral stand on the question.

Kelly and Clyde E. Weed have been in Miami and Inspiration inspecting Anaconda properties.

★ The Buckeye-Apache Mines reports completion of its road and camp building program and is now drawing plans for the installation of a 150-ton cyanidation plant. C. W. Gabrielson is president.

★ The following report appeared in these columns on page 112 of the January 1947 issue: "Silver Crescent Mining Co. recently began operations on a deposit near the Tiger mine, at Mammoth, estimated to contain millions of tons of silver-bearing ore. The company is composed of thirty residents of Mesa who are working 150 of the 300 claims located around the strike. Roy Tullen discovered the silver ore last January. Milton Roe, managing agent of the company, asserts that the discovery is one of the largest silver deposits ever found in Arizona and that it also contains much gold and copper."

Subsequent information develops the fact that operations are not in progress as reported. The corrected account should read as follows: Silver Crescent Mining Co. reports indications of large silver-copper orebodies on its property near Mammoth. It is planned to carry on further exploration work as soon as funds are available. John Rhodes, of Mesa, is in charge of the property.

NEW MEXICO

Legislature kills bill to increase severance tax

★ G. C. York, head of the York Mining Co., Albuquerque, has announced that his company will soon launch an expansion program, which includes a concentrating plant near Albuquerque to handle copper-lead-zinc ores from some of the 30 claims held by that company in Socorro and Bernalillo counties. Papers of application to incorporate have been signed and operations are expected to begin soon.

★ The Gila Fluorspar project is in operation to clean up a war-accumulated stockpile of fluorspar ore. The Shattuck Denn Mining Corporation, as agent for RFC, is operating the plant, which is 30 miles west of Silver City. In charge of the operation is H. R. Hendricks, chief metallurgist for Shattuck Denn, with Coyne Hunt as plant superintendent.

Plant rehabilitation began last August after an approximate two-year shutdown. The mill, which began operation in October, went on a two-shift basis in November. The heavy-media plant capacity was increased to approximately 220 tons average for the two-shift day.

A metallurgical-grade product is made by jig concentration of the finer feed and heavy medium (ferrosilicon-magnetite) separatory cone concentration of the coarser mill feed.

★ Highlights of New Mexico's legislative session which ended March 15 are: (1) Passage of a "Right-to-work" bill for Constitutional Amendment at the next general election; (2) A one-year statute of limitations bill on labor liens, and, (3) The killing of a bill to increase the severance tax on natural resource products from 1/8% to 1%. (All products now 1/8%, except oil and gas at 2% and potash at 1%.)

★ John A. Garcia has been appointed State Inspector of Mines by Governor Mabry to succeed the late Warren G. Bracewell. Mr. Garcia was formerly with the U. S. Bureau of Mines safety division.

TEXAS

Proposed bills would levy taxes on Texas mineral output

★ A tax on Texas products, including timber and minerals, is being proposed to the Legislature by Representative Harley Sadler. Mr. Sadler said he does not intend to press for passage of the bill unless the Legislature has to raise additional revenue to meet the appropriations it makes at this session. This was proposed

as an alternative money-raising plan to taxing gas, oil, or sulphur, as several other bills would do.

Representative C. S. McLellan's tax of 1.85¢ per thousand c.f. on natural gas gathered by pipe lines is set for consideration of the House of Representatives March 18. McLellan estimates it would yield $36,000,000 a year.

Mr. Sadler believes his bill would bring $25,000,000 to $30,000,000 annually from sources not presently taxed directly to support the State government. His proposed taxes include 6¢ per ton on salt; 10¢ per ton on cinnabar ore; ½¢ per ton on iron ore; and 5¢ per ton on all other ores; 5¢ a ton on coal, lignite, peat, and coke; 2½¢ per 100 lb. on lime; 5¢ a ton on asphaltic limestone and basalt; 18¢ a ton on bentonite and fuller's earth; 5¢ a ton on crude feldspar, chromite, fluorspar, graphite, cake salt, strontium, sulphate, or celestite; 1/20¢ a ton on gypsum; 5¢ a ton on pumice or pumicite; 10¢ a ton on soapstone; 2½¢ a ton on sand, shell, gravel, and clay; 2 to 5¢ a ton on limestone; 5¢ a ton on granite, marble, and sandstone.

UTAH

New rail line to link Bingham to concentrators — Employees honored by U. S. Smelting

★ The construction of some 14 miles of new trackage for ore transportation between the open-pit copper mine at Bingham Canyon and the Arthur and Magna mills is announced by D. D. Moffat, vice president and general manager, Utah Copper Division, Kennecott Copper Corporation. The new trackage, the cost of which is estimated at about $4,000,000, will start at the new yards under construction at the mouth of Bingham Canyon and will follow the edge of the foothills north to the concentrators, where the ore-receiving yards are being enlarged. Motive power on the rail line will be furnished by electric locomotives, which in turn will draw their energy from a new transmission line costing $225,000. Construction work on the project is under the supervision of George C. Earl, chief engineer. It is expected that the line will go into operation around the end of the year, depending on the delivery of materials. Seven new electric locomotives are scheduled for delivery this summer. Moffat stated that the decision to make this substantial investment in new equipment and trackage was in line with the company's long-time policy of adopting every possible improvement calculated to increase efficiency.

★ United States Smelting, Refining & Mining Co. honored 230 employees who have served the company 20 years or longer at a banquet on Feb. 16.

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Utah *(continued)*

F. S. Mulock, vice president and general manager of Western operations, announced that of 551 Midvale plant employees, 189 had been with the company 20 years or more; also 13 of 237 employees at the U. S. mine and 27 of 117 employees in Salt Lake City. Five had more than 40 years of service.

★ The annual convention of the Rocky Mountain Federation of Mineral Societies will be held June 12 to 15 at the Newhouse Hotel, Salt Lake City, Junius J. Hayes, president, announces. The first two days will be devoted to mineral exhibits, and buying, selling, and trading of minerals, in addition to general meetings, business meetings, and a banquet. The third and fourth days will be occupied by an overnight field trip to Topaz Mountain, Millard County, to collect mineral specimens. Representatives are expected from Colorado, Arizona, Nevada, New Mexico, Texas, Kansas, and Utah.

★ A cave-in on Feb. 25 of a large bank of ore fatally injured Lester C. Voeltz, 37, while he was repairing a power shovel at the Bingham open-cut mine of Utah Copper division, Kennecott Copper Corporation. He was given a blood transfusion at the mine's emergency hospital station before being taken to a Salt Lake City hospital, where he died March 1.

NEVADA

Getchell prepares to start up mill —Anaconda proves large copper deposit in Copper Flat area

★ Getchell Mine, Inc., foremost Nevada gold producer before the war, is preparing to operate one unit of its milling plant, enlarged from 1,000 to 1,500 tons' capacity and equipped for primary flotation before cyanidation to eliminate costly ore roasting, George Wingfield, president, and R. A. Hardy, directing engineer, have announced. Delay in delivery of essential mill equipment may retard capacity operation. A steel headframe is being constructed at the new three-compartment shaft, 3,500 ft. north of the mill, where deep drilling exposed ore of good grade. A short crosscut from the shaft, it is indicated, will cut the Getchell ore channel at 700 ft., or 1,200 ft. below the apex on its east dip. A crosscut on the 265-ft. level is nearing the vein. Crosscuts from the open-pit workings near the mill have developed mill-grade ore ranging in width from 20 to 65 ft., adding substantially to the visible ore reserve.

★ Newmont Mining Corporation, through the medium of its subsidiary, Esmeralda operation, has been expanding its activities in the Goldfield district. Having repaired the 1,300-ft. Silver Pick shaft to the 700-ft. level, the company is now engaged in reopening the main Florence shaft and laterals on the 358- and 408-ft. levels. Local inquiry has brought denial of reports that high-grade ore had been opened in the Florence ground.

★ Drilling and shaft work conducted over a period of more than two years by International Smelting & Refining Co. on the Copper Flat area, west of Yerington, Lyon County, is indicated by Anaconda engineers to have developed 80,000,000 tons of ore with average content of 1.02% copper. Drilling and sampling were completed late last year, and no decision has been reached in connection with plant installation.

★ Adaven Mining Co., of Austin, Minn., has been assembling a washing plant with a capacity of 300 cu.yd. per hour, including a 1½-yd. dragline, on a 960-acre tract of detrital gravel in the Rosebud district, northern Pershing County, leased from Rosegold Mining Co., R. L. Schneider, president. The plant is constructed by the inventor, Elmer Pitcher, of Austin, Minn.

★ Copper Canyon Mining Co., operating the Copper Canyon and Copper Basin mines and 350-ton flotation mill in Lander County, in 1946 had the highest production since 1943, Robert H. Raring, directing engineer, reported to L. E. Whicher, New York, president of the company. The mill treated 76,714 dry tons of copper-gold-silver ore from the main shaft workings, or more than 250 tons per day, and is now at capacity of 350 tons. Additions have been made to mine and mill equipment, and a complete metallurgical testing laboratory was provided. Dow Chemical Co. engineers conducted flotation tests on oxidized copper-gold ore, with favorable results. The U. S. Geological Survey completed underground and surface studies of the area. Despite the continued labor shortage, a substantial amount of exploration was carried out.

★ Nevada Silica Sands, Inc., is completing construction of one of the largest and most advanced processing plants in the country at its deposits near Overton, Clark County, and will soon abandon the plant it has operated for many years. The new plant includes a drying unit.

★ Amalgamated Development Co., of Reno, M. E. Bohannan, manager, with claims covering part of the Mountain City copper belt east of Anaconda's productive Rio Tinto mine, will soon undertake extensive diamond drilling and is driving a crosscut tunnel a mile north of the copper zone to cut a vein opened in adjoining ground by a similar adit that exposed a 4-ft. width of high-grade silver-gold ore. The tunnels are well below the water table and below productive old workings where water halted further sinking.

★A shaft sunk by J. O. Greenan, mining engineer and operator, of Reno, to develop a talc deposit near Talcton, Esmeralda County, is reported to have exposed silver ore of high grade, and the product was being sacked for shipment to a smelter. A second shaft is being sunk and a compressor and a truck have been purchased.

IDAHO

Bunker Hill plans for 3,000-ton central milling plant—Increased gold-dredging activity noted

★Gold dredging in Idaho is gradually coming back to its prewar status, according to Walter Hovey Hill, mining engineer, of Grangeville. Two miles below Lucile, on the Salmon River, the first pumper dredge to be tried out in the State has been installed by Crescent Pacific Mining Co., of San Francisco. This company has a 10-year lease from the State on 10 miles of the river bed. The success of this operation has induced other companies to install similar pumper dredges. Two miles above the mouth of White Bird Creek a new pumper dredge is being built by the Wallberg Dredging Co., and one mile above this point the same company is installing another pumper dredge. Four miles above White Bird a pumper dredge is being installed by C. S. Pringle, of Thompson Falls, Mont.

★Lucky Friday Silver-Lead Mining Co. has completed 2,000 ft. of drifting on the 1,400 level, 450 ft. of which was in high-grade ore. The company is now engaged in connecting the levels with raises between the 1,400 and 800 ft. levels to provide air for stoping operations.

★Silver Bowl Mining Co., which recently made a good discovery of ore in the old Senator Stewart mine, at Kellogg, has started steady production under the management of Ralph W. Neyman, mine superintendent of Hecla Mining Co., who was recently elected vice president and operating manager for Silver Bowl. Neyman has appointed Ellis Miles, formerly with the Sunshine company, as mine superintendent. The company has one stope open for a length of 70 ft. and is preparing to open a second stope. Ore produced is said to average around $30 per ton in lead, zinc, and silver values.

★Gibbonsville Mining Co. has made exhaustive tests with test holes and small mill runs on a tailings deposit on the flats west of the Bunker Hill mills, west of Kellogg, and estimates that at least $1,000,000 is contained in the tailings, which have accumulated over a period of 50 years. The muck is very fine, and the company has had difficulty in working out a treatment process. It is now reported

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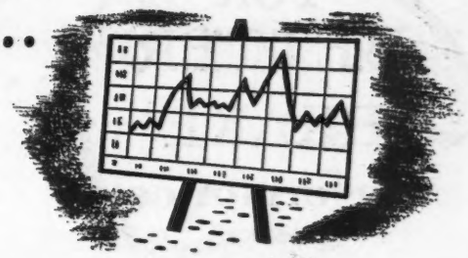

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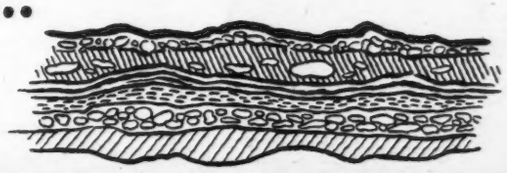

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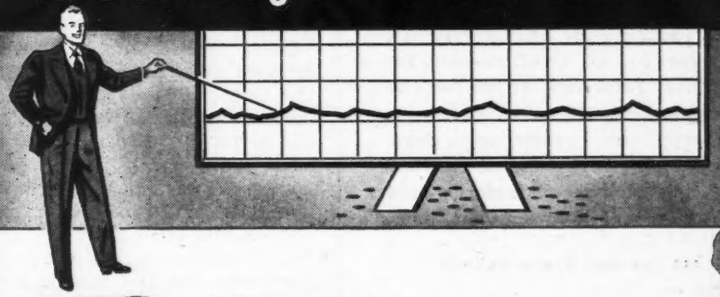

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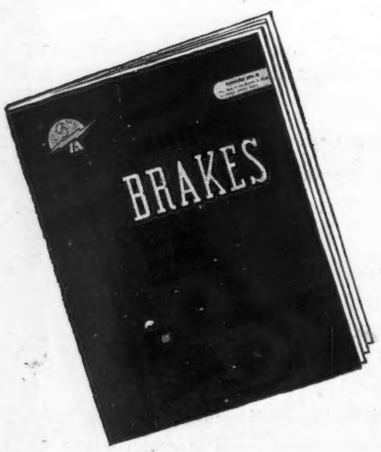

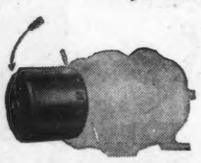

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Idaho *(continued)*

that Zanetti Brothers, who own the Galena custom mill at Wallace, plan to lease the entire tract.

★ Nevada-Stewart Mining Co., between the Sidney and Highland-Surprise mines, on Pine Creek, announces the completion of a 300-ft. raise from the lower tunnel level to the surface. This raise followed the orebody as nearly as possible, and the ore produced was milled at the Highland-Surprise plant, helping in a large measure to pay expenses. At a meeting of the directors of the company, scheduled at Kellogg March 5, a proposal was to be submitted to the stockholders to raise the stock capitalization of the company from 1,500,000 shares to 2,500,000 shares to provide funds for further drifting and sinking operations.

★ Bunker Hill & Sullivan Mining Co. is producing at the rate of 1,000 tons daily in its 1,800-ton milling plant, according to J. B. Haffner, general manager. The company has 1,750 men on the payroll, the largest number available for several years, and has been able to increase its lead smelter production 70% above the 1946 rate to 3,500 tons of refined lead per month. Plans are nearly completed to increase milling capacity to 3,000 tons daily in one central plant.

★ More than 20 mining companies in the Coeur d'Alene district have filed motions in Federal Court for dismissal of portal-to-portal pay suits. The suits claim back pay over a long period of years for time consumed in going to and from work, changing clothes, and other activities heretofore not considered part of the day's work. Attorneys for the mining companies contend that answering the interrogatories demanded in the complaints would involve endless time and expense.

★ Clayton Silver-Lead Mines Co. reports a net profit of $2,586 for the year 1946, compared with $24,350 in 1945. Gross receipts from ore shipments were $134,291. The company operates a property at Clayton, Idaho, under the management of Norman Smith, formerly geologist with the Sunshine company.

★ The University of Idaho School of Mines is investigating the possibility of recovering manganese from extensive low-grade sand deposits in Washington County, near Weiser, according to A. W. Fahrenwald, dean of the institution.

★ Dayrock Mining Co., in Nine Mile Canyon just north of Wallace, has developed a silver-lead orebody for a length of 650 ft. on the 650-ft. shaft level. The ore is from 4 to 15 ft. wide. Hand samples assay 35.2 oz. in silver and 55.2 percent lead per ton. The property is equipped with a modern 150-ton flotation mill.

★ Development work at the Sunshine mine during 1946 produced 51,044 tons of ore, according to Ross D. Leisk, manager. After milling, this tonnage produced 6,760 tons of lead-silver concentrates, which, in turn, yielded 3,948,371 lb. of lead, 2,469,252 oz. silver, and 607,240 lb. of copper. Mill heads assayed 4% lead and 49.1 oz. silver per ton. Mining costs were $10.62; treatment, $1.34; depreciation was 54¢; general expense and overhead, $7.51; total, $20.01 per ton. Sunshine's ore reserves, blocked out and ready for mining, are estimated at 1,230,000 tons, a considerable increase over last year's figures.

In the same report, President R. M. Hardy reports that net Sunshine profits from all operations in 1946, after making provisions for income taxes, will total $619,712.32. Dividends paid stockholders during the year totaled $695,528.40.

★ Nancy Lee Mining Co., owner of the King & Queen mine and other mining property at Keystone, Mont., announces the purchase of the Bobby Anderson and Amy Matchless properties in the Pine Creek section of the Coeur d'Alenes, southwest of Kellogg. Both are old, with intermittent production records. The Amy Matchless is equipped with a 125-ton flotation mill and a 400-ton sink, float unit.

★ A recent survey of the milling capacity of the Coeur d'Alene mining district by W. Earl Greenough, manager of Atlas Mining Co., shows a total of 33 active concentrating mills with a total capacity of 13,000 tons per 24 hours.

★ The U. S. Geological Survey has released a preliminary report with a possible bearing on atomic energy development from the huge phosphate-vanadium beds in Idaho, Wyoming, and Utah. The report will be incorporated in a more comprehensive statement, now in preparation, on the vanadium in the phosphate shale member of the Phosphoria geological formation. San Francisco Chemical Co. is producing between 30,000 and 40,000 tons of phosphate rock per month from quarries near Montpelier, Idaho, and is reported to be negotiating the sale of several hundred thousand tons of phosphate material to the War Department in 1947. L. T. Kett, of San Francisco, is president of the company and D. L. King is resident superintendent at Montpelier. Homestake Mining Co. did the preliminary work on the Montpelier phosphate-vanadium beds for the Government during the early part of the war.

★ The finding of several stones described as diamonds in the McCall area reportedly has led the Modern Development Co., of New York, to lease some property in the district and engage engineers to make an investigation. The interest in the property, about five miles west of McCall, where diamonds, sapphires, and garnets have reportedly been found, was disclosed by J. K. Vaught, of Boise,

owner of property near McCall, and John Glass, of Weiser, resident engineer for the Eastern mining firm of Goodman & Goodman, of New York. Glass said that he is laying the groundwork for full-scale prospecting of the district. He added that accounts of diamonds being found in the area in earlier years are substantiated by a State Mine Inspector's report issued in 1912, mentioning the discovery of diamonds, sapphires, and garnets during placer gold operations.

MONTANA

Last Chance Gulch association holds annual meeting

★ Smith Mining Co., of Wallace, Idaho, is reported to be reopening the Iron Mountain mine, a few miles from Superior, in Mineral County. The Iron Mountain property was worked many years ago by Federal Mining & Smelting Co., and has been operated intermittently by other concerns. The property is opened by a long haulage and drainage tunnel.

★ Last Chance Gulch Mining Association, Helena Chapter of the Mining Association of Montana, held its annual meeting and banquet at the Placer Hotel, in Helena, on Feb. 26. The meeting was presided over by Charles R. Brazier, Helena, and W. R. Wade, of Marysville, manager of Montana Rainbow Mining Co. Carl J. Trauerman, of Butte, secretary of the Mining Association of Montana, outlined the recent work done by his organization. J. G. Evans, of the Gardner-Denver Co., at Butte, gave an illustrated talk on mining in South Africa. Officers elected by the Last Chance organization for 1947 were: A. Strojan, Jr., manager of the mining operations of Winston Bros. Co., president; Stanley M. Lane, metallurgist for American Smelting & Refining Co., vice president; Milton I. Leydig, manager of Mines Development Co., vice president; Charles R. Brazier, secretary of Golden Messenger Corporation, vice president; and Hugh K. Gaw, secretary-treasurer.

WASHINGTON

Sullivan Mining Co. takes over big Metaline acreage—Admiral Consolidated to install mill

★ W. R. Bellows, of Spokane, president of Metaline & Pine Creek Consolidated Mining Co., announced on March 8 the acquisition of about 3,000 acres of mineral holdings in the Metaline district by Sullivan Mining Co., of the Coeur d'Alenes, jointly owned by Bunker Hill & Sullivan and Hecla Mining Co. The acreage acquired includes the Metaline Contact,

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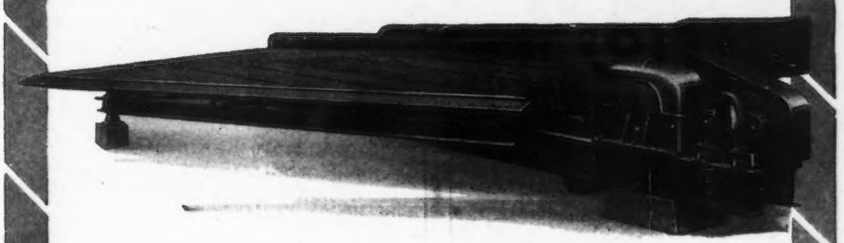

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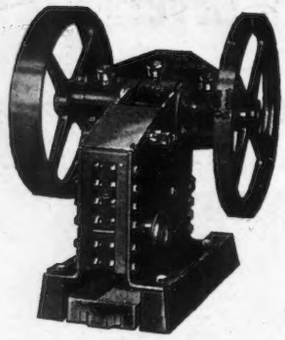

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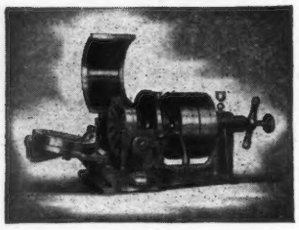

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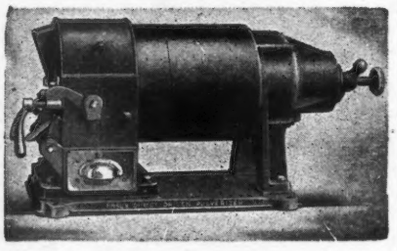

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Washington *(continued)*

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It is understood that about 1,500 acres in this district has been held by Hecla, making the Sullivan holdings now about 4,500 acres. The Sullivan company will start an extensive diamond-drilling program this spring, according to L. E. Hanley, president.

★ Wellman A. Clark, Spokane attorney, reported to Northwest Mining Association March 10 that several changes are due in SEC regulations to encourage prospecting and mine development. It is proposed to create an exemption of $25,000 for initial prospecting offers. It is also proposed to remove from the present $300,000 registration exemption rule the provision permitting State security officials to interfere with offerings made from outside the State by mail; to simplify prospectus requirements for assessable companies desiring to raise up to $100,000 in any year; and to adopt a rule permitting the use of a circular with a blank on which recipients may ask that a prospectus be mailed, replacing the present rule which requires the mailing of a complete prospectus with the first mention. Clark said the chief of the interpretation section of the SEC, at Philadelphia, has agreed to present the association's case to the commission "in a favorable light."

★ Arthur C. Ballard, of Auburn, secretary-treasurer of Azurite Gold Co., which owns the Seattle group of mining claims, in Whatcom County, has reported to stockholders that development work must be done and a new reduction plant built before production can be resumed at the property. The company hopes for construction of a new highway which will enable it to ship crude ore to the Tacoma smelter without the necessity of constructing a reduction plant.

★ Admiral Consolidated Mining Co. has a 100-ton mill ready to set up on its property, near Leadpoint, as soon as weather conditions permit, according to F. J. Cardinal, of Spokane, president. The mine has been worked for the past two seasons, and has been developed by open cuts, two short shafts, and 600 ft. of crosscutting. Some good ore has been encountered and drifted on for 75 ft., according to Cardinal, and two cars of zinc-lead ore averaging $90 a ton have been shipped to the U. S. Smelting & Refining Co. at Salt Lake. The milling ore is being stockpiled.

★ Basic Metals, Inc., is employing 15 men in three shifts at its Cleveland silver-lead-zinc mine, nine miles west of Hunters. The 100-ton flotation plant produced in February five to six tons a day of lead concentrates, with some silver, and one and one-half ton of premium zinc concentrate. C. L. Miles is general manager.

★ Grandview Mines, which is operated on a royalty basis by American Zinc, Lead & Smelting Co., authorized a dividend of 1c. per share, amounting to $30,000, to be paid to its stockholders on April 15.

★ Western Machinery Co. has given an unidentified group a 90-day option on the copper property formerly owned by Royal Development Co., 40 miles north of Leavenworth. The machinery company is disposing of the little-used 300-ton mill and other mining equipment, such as electric locomotives and power generating units, all of which it purchased from the receivers of the Royal company. The mine is opened by a tunnel 11,000 ft. long and other workings. It is reported that the optioners will do considerable diamond drilling at the property if the preliminary examination is satisfactory.

★ Operation of the sixth potline at the Mead aluminum plant has been delayed due to a shortage of soda ash, but the unit is expected to resume in April. D. A. Rhodes, vice president and general manager of Permanente Metals Co., said in Spokane in February that the first potline at the Tacoma aluminum plant would go into production in March, which would have been ahead of schedule.

IRON COUNTRY

Riddell shaft mucking tried at Ironton mine—International Harvester sells ore mines

★ Pickands, Mather & Co. is sinking the vertical shaft an additional 900 ft. at the Ironton mine, on the Gogebic Range near Bessemer, Mich. The first 450 ft., now completed, was put down by conventional methods, but for the second 450 ft., the shaft is being equipped with the Riddell system of mechanical mucking, so that comparative costs can be obtained. When finished the shaft will be nearly 3,000 ft. deep.

★ The Mather mine, at Ishpeming, Mich., equipped to produce the largest tonnage of iron ore at depth in the Lake Superior region, narrowly escaped drowning out its lower levels on Feb. 20 when a large vug of water was unexpectedly struck on the 2,050-ft. level while driving a sublevel drift. Temporary dams were put in on the 2,050 and 2,200 levels, and water filled the drifts to the top. A temporary 500-g.p.m. pump was installed on the 2,200-ft. level to raise the water to the 1,000-ft. level, where a second pump relayed it to surface. Pumps on the 1,750-ft. level handled 700 g.p.m. Still the water rose, and it became necessary to use the 210-cu.ft. skips as bailers, which removed water at the rate of 700 g.p.m. After 48 hours the water started to fall. Hoisting was resumed after losing four

days' production. The permanent job pump will be installed on the 2,200-ft. level and concrete dams poured on the 2,050- and 2,200-ft. levels to forestall a recurrence.

★ Most of the iron-ore companies operating in the Lake Superior region have extended existing contracts with the local CIO unions, due to expire Feb. 15, until May 15. It is hoped that new contracts will have been agreed upon through collective bargaining before that time.

★ The shaft at the Cary mine of Pickands, Mather & Co., near Hurley, Wis., is being sunk an additional 550 ft. by the incline-slusher system. This eliminates most of the manual labor, requires fewer men, and can be carried on while driving drifts on the upper levels.

★ Two new diamond-drill holes are being bored by Cleveland-Cliffs Iron Co. east of Ishpeming, Mich., near the railroad yards of the L. S. & I. railway. These holes are almost due south of the new Mather mine and are being driven day and night.

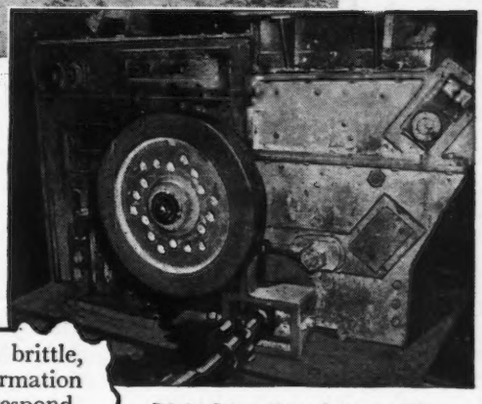
★ International Harvester Co. has announced that it has sold the plant and equipment of the Wisconsin Steel ore mines on the Mesabi Range to Cleveland-Cliffs Iron Co., effective March 1. The company is withdrawing from operation of its iron-ore mines, which included the Hawkins, Agnew, and Sargent mines properties, west of Hibbing, with estimated reserves of 7,000,000 tons. These properties have been idle since Feb. 8, 1946, because of the strike of United Steel Workers, CIO, which has never been settled. They employed about 250 workers. Cleveland-Cliffs will start operation of the mines immediately, rehiring as many as possible of the old employees, with special consideration given to those having five or more years' service.

★ Iron-ore explorations of the M. A. Hanna Co. in Labrador and Quebec are developing satisfactorily, but much more work must be done before they can be regarded as offering commercial possibilities, G. M. Humphry, president, informed shareholders in reviewing the company's 1946 operations. The iron-ore exploration in Brazil has been disappointing, he added, and drilling will be discontinued unless there is a change for the better within a few months.

★ M. A. Hanna Co. is conducting a research program on iron-ore beneficiation at the laboratories of Pan-American Engineering Co., Berkeley, Calif., and has retained D. N. Vedensky, chief metallurgist for Pan-American since 1932, as consulting research engineer on the project. The program embraces studies of methods of concentration for various grades of ore. Later in the year it is planned to establish a new metallurgical laboratory and research group at Hibbing, Minn., under Vedensky's direction, Hanna officials state.

HIGH MOISTURE CONTENT *Won't Stop a* DIXIE

Dixie Hammermill's Greater Efficiency Demonstrated at Mississippi's Lime Plant No. 2



Dixie 36 x 40 inch Non-Clog Hammermill with Patented, Exclusive Moving Breaker Plate in operation at Mississippi's Lime Plant No. 2, Cedar Bluff, Mississippi.

Far from being hard and brittle, the limestone in the Selma formation is soft and sticky and correspondingly difficult to pulverize Even with average moisture present in the stone, the material has a tendency to clog most crushers, and it was only after considerable study of a number of different make machines that the present equipment was adopted.

Wet, sticky material presents numerous operating difficulties to ordinary hammermills. Choke-ups often result, production may be slowed, costs can increase and profits dwindle.

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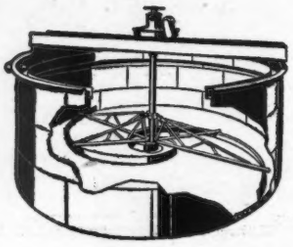

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Iron County *(continued)*

The Hanna company is also participating with other companies in metallurgical research of a similar nature at Battelle Memorial Institute, Columbus, Ohio.

★ The Mesabi Range expects to contribute substantially to the estimated 75,000,000-ton Lake Superior district shipments for 1947. Extensive stripping programs are still under way. New equipment is being delivered daily. Cleveland-Cliffs have recently received a new 4-yd. Harnischfeger electric shovel at the Canisteo mine. The Oliver Iron Mining Co. has ordered four 1,500 diesel-electric locomotives for mine haulage from the American Locomotive Co., and 17 Euclid trucks have also been purchased.

★ A new 40-ton Euclid truck has been delivered to the Mississippi mine of the M. A. Hanna Co. It is the largest truck on the Mesabi range. Over-all the truck is 11½ ft. wide, powered by a 550-hp. Cummins motor.

MICHIGAN

Seneca equips for mechanized operation—Calumet official urges limited tariff lifting

★ Judge Paul G. Eger, of the Ingham County Circuit Court, has filed an opinion denying unemployment compensation benefits to between 700 and 800 mine workers who were left unemployed when the Copper Range Co. closed its mines on Sept. 20, 1945. The benefits were originally allowed by the Michigan Unemployment Compensation Commission on a split vote. The company appealed the case.

The Mine, Mill and Smelter Workers Union (CIO) contended that the closing was no fault of the workers. Judge Eger decided that the closing was the result of votes taken by the men themselves and not an arbitrary action on the part of the company. The first vote was taken on Sept. 2, 1945, when the employees rejected a company proposal to amend an existing contract so that operations could be continued. The employees again rejected the company's proposal in another vote taken on Sept. 16, 1945. In a third vote, taken on Oct. 9, 1945, the employees voted in the affirmative, but by that time the closing of the mines had progressed so far that it was deemed impossible to reopen.

Changes in the contract proposed by the company were the result of the termination of the company's subsidy contract with Metals Reserve Corporation. It is expected that the decision of the Ingham County Court will be appealed to the State Supreme Court.

★ The Nordberg steam hoist formerly used at No. 13 shaft on the Osceola lode, at Calumet, has been transferred to No. 2 Seneca shaft and will be ready for operation April 1. It will be capable of operating from a maximum depth of 6,000 ft. Shaft rehabilitation has been completed to the 21st level in both skipways. A section of the shaft between the 21st and 25th levels was not completed by the Seneca Mining Co., which suspended operations in 1930, and broken ore between those levels must be removed and the shaft timbered before it can be used. Development work probably will be started on the 22d level north and south soon after the hoist is in operation. Seneca No. 2 shaft, when completed to the 33d level, will be 5,593 ft. from the shaft collar. The entire area between the 21st and 33d in Seneca ground has not been explored. Should the work contemplated open an orebody of commercial grade, the shaft should be on a self-sustaining basis by Jan. 1, 1949.

Eight-ton skips and 8-ton cars will be used, and breaking and handling of ore will be mechanized with the most modern equipment obtainable. Automatic-feed drills, jumbos, tram cars and skips, mechanical loaders and scrapers, and underground locomotives are on order to the amount of $300,000.

★ E. R. Lovell, president of Calumet & Hecla, has the following to say concerning the import duty on copper:

"A large group of American fabricators and manufacturers is striving to have the 4c. import duty on copper removed so that foreign copper may move freely into this country. This group wants the duty swept away permanently. Another group, made up of domestic producers, of which Calumet & Hecla is one, admits there is a temporary abnormal demand for copper and believes the best solution is to suspend the duty temporarily. This group rightly contends that the time will come in the near future when the domestic demand can be adequately satisfied by United States mines. When this happens, an import duty on copper will again be badly needed, just as it was during the thirties. Without a protective tariff, low-cost copper from Canada, Chile, Africa, and possibly Russia would flood this country and depress the price to a point where domestic underground copper mines would be forced to shut down."

MISSOURI

Seismograph surveys continuing in Washington County

★ National Geophysical Co., of Houston, Tex., has finished a seismograph survey for American Metal Co. near Palmer, in Washington County. Further exploration for Minerva Oil Co., of Eldorado, Ill., is now under way

in the same area. J. H. Steinmesch is in charge for the Minerva company and K. H. Waters, of Houston, is in charge of the survey work for the National Geophysical Co.

★ Among reports of interest to the minerals industry just recently published by the Missouri Geological Survey, according to Dr. E. L. Clark, director, is "Mineral Resources of Morgan County, Missouri," by William Mather.

★ The Missouri School of Mines will graduate approximately 50 mining engineers and 25 metallurgical engineers during 1947. Enrollment at the school, now 2,200, is still more than double the prewar figure, and is expected to continue at a high level until about 1950.

TRI-STATE

Permanent Premium Price Plan is pressed—Two new shafts near completion in Kansas area

★ A resolution calling on Congress to enact legislation providing Government assistance which would enable zinc and lead mines of the Tri-State district to continue production was adopted at a special membership meeting Feb. 13 of the Tri-State Zinc & Lead Ore Producers Association, in Picher, Okla. The action was taken with a view toward establishment of a permanent Premium Price Plan to succeed present federal aid after June 30.

The action followed a report by O. W. Bilharz on the recent 50th anniversary meeting of the Colorado Mining Association in Denver, where a similar resolution was passed by representatives of the Western mining industry. Bilharz, who presided at the meeting, also read a telegram from Howard Lee, regional director of the International Union of Mine, Mill and Smelter Workers (CIO), in which it was pointed out that the national wage policy committee of the international union had voted support to appropriate measures designed to assure continuance of marginal mining operations.

★ A lecture advocating a descensionist hypothesis of Tri-State ore deposition was presented by Dan R. Stewart, geologist for American Zinc, Lead & Smelting Co., at a meeting of the Tri-State section, American Institute of Mining and Metallurgical Engineers, on Feb. 13 in Picher.

★ Sinking of two deep shafts in the Kansas section of the Tri-State field is nearing completion. One of the shafts is being sunk by Fred J. Childress & Sons, together with Lincoln L. Smith, of Joplin, on the Vanatta lease, south of Melrose and bordering the Kansas-Oklahoma state line on the south; the other is that of MacArthur Mining Co., on the Spar-

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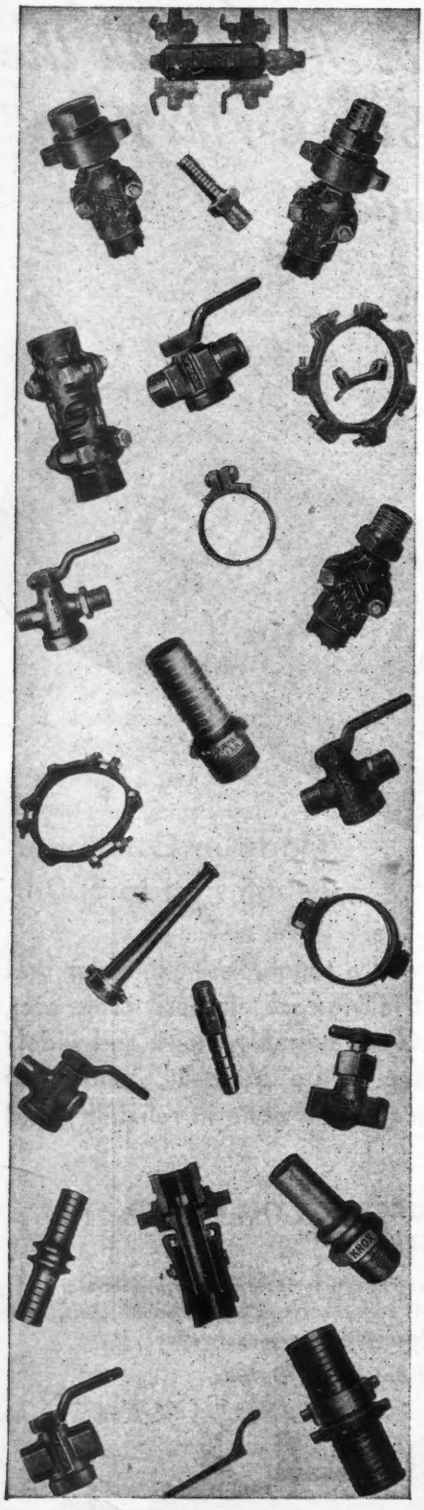

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Tri-State *(continued)*

lin land, three miles west of Baxter Springs and just north of U. S. Highway 166. Both shafts are now in ore. Ore in the Vanatta entered at 410 ft. is expected to bottom around 426 ft. Little water was encountered in the sinking of the two shafts, but it was expected that the next 10 to 15 ft. of sinking would bring in a heavy flow. A 9-in. Peerless pump has been installed to handle water encountered at the Sparlin shaft. According to J. W. Hoffman, of Joplin, general manager of the MacArthur company, an upper run of ore in the M-bed formation from the 325 to 335-ft. levels will be mined first; later the shaft will be put down to a depth of 410 ft. into the sheet ground. When the mine is opened, ore will probably be trucked to the No. 3 mill of Beck Mining Co., in the southwest part of Baxter Springs.

The Vanatta shaft was put down in an area tested by more than 30 churn-drill holes. According to Harold Childress, who will be in charge of operations, the average drill-cutting assays were around 5% in zinc and lead recovery values. The Childress group obtained a Government loan of $75,000 to develop the mill site blocked out by the favorable drilling. However, it is planned to mill the ore at the nearby United Zinc Smelting Corporation's Park Walton plant. Leon Childress is among those interested in the Vanatta project.

ILLINOIS and KENTUCKY

Inland to install Heavy-Media plant at Keystone mine

★ The Inland Steel Co., Fluorspar Division, of Rosiclare, Ill., has purchased a Western-Knapp Mobile-Mill, Heavy-Media Separation plant for its Keystone mine, in the Kentucky district, near Salem. The new operation will beneficiate low-grade ore and increase reserves at the Kentucky mine, according to Paul Richards, superintendent, and will eliminate the 18-mile ore haul to Inland's mill, at Rosiclare. The new mill is scheduled to begin operation Aug. 1.

★ Construction of a new highway to the Ohio River ferry landing on the Illinois side, which was promoted by mining companies of the Illinois-Kentucky fluorspar district, has been started by county authorities. The mining companies backed the project for the new road, extending from Highway 34 to Jack's Point Landing, as it will cut the time of ore-hauling from Kentucky mines to Illinois mills by reducing ferryage distance. The companies will pay for right-of-way, surfacing material, and culverts, and Hardin County, Ill., will furnish equipment and labor.

ALASKA

U. S. Smelting to reduce scale of operations—Dant & Russell will drill gypsum deposit

★ Territorial Senators John Butrovich and Ed Coffey have introduced Senate Bill No. 32 to repeal the gross gold tax and substitute a graduated net income tax on the output of the mines. This tax increases gradually from 4% for amounts over the first $1,000 to 8% for amounts over $100,000. The bill also makes an allowance for depletion. Al Anderson, secretary of Alaska Miners' Association, said in February that the "outlook is favorable for a net gold tax in lieu of the gross tax."

★ Alaskan mining men are interested in a bill introduced in the territorial legislature by Representatives Johnson, Meath, Joy, and Coble to create an office of Commissioner of Assistance to Prospectors, with the Commissioner of Mines serving as ex-officio executive officer. The Commissioner would handle any funds coming from the Federal Government for mineral development, supervise prospecting, cooperate with the Territorial University and other agencies in training prospectors, and determine regions for prospecting and equip camps. Persons eligible for these benefits would have to be U. S. citizens, discharged veterans, or residents of the Territory for one year.

★ Prospectors have been advised by Larry Doheny, of the RFC office at Fairbanks, that each individual can stake two placer claims per month in each recording district but that several of the districts in the Fourth Division have been absorbed by the Fairbanks Recording District.

★ Camp construction has been proceeding at the Snowbird Mining Co.'s gold-quartz property, in the Willow Creek district, the past two years, according to Chris Poulsen, president, and plans are drawn for the erection of a 50-ton mill.

★ Santiago-Alaska Mines, Inc., which operates the Dolomi gold mine, has had 50 tons of machinery shipped north. This will be taken by scow to Dolomi, according to Heinie Tweit, foreman. An operating crew will go by barge to the property when the lake thaws.

★ According to Roy B. Earling, manager of Alaskan operations, U. S. Smelting, Refining & Mining Co. will operate on a reduced scale this season. A crew of 50 started drill thawing early in February, at Chatanika, in preparation for dredging operations, which will begin the first of April. Four dredges will be used. Thawing and stripping will also begin soon on the Davidson Ditch, in the Fairbanks area, under the management of R. J. Ogburn.

★ Dant & Russell, Inc., of Portland, Ore., optioned the Gypsum-Camel claims, 35 miles southwest of Juneau, on Chichagof Island, from Dave Housel and associates, of Juneau, last fall. A drilling program will determine the extent and depth of the gypsum, and nearby areas will be explored with the hope that an adequate supply may be found to meet the increasing requirements of the Dant & Russell company.

GEORGIA

Tennessee Corporation to center research at College Park

★ All research activities of the Tennessee Corporation are being consolidated and moved to the research laboratory which is being established at College Park, Ga. The company has purchased a 22-room residence with ten acres of land and is remodeling the building into offices and laboratories. Dr. J. K. Plummer, chairman of the research committee, will head the new research laboratory, and E. N. Conroy, director of the research department of Tennessee Copper Co., at Copperhill, Tenn., will be director. The company plans to transfer between 25 and 30 top research technicians from its various plants to the new laboratory, which is to be in operation by late summer. It is reported that much research will be directed toward perfecting fungicides from copper sulphate.

★ Southern Limestone, Inc., has started mining operations at Sandersville, Ga., and plans to install crushers and loading machinery with capacity to produce 20 cars daily. Henry Brandon, president, stated that his company would produce pulverized limestone and that geologists have estimated the potential of the deposits at more than 12,000,000 tons.

CANADA

Relief measures for gold mines announced — Survey route for Labrador railway — Massive ore outlined at Lynn Lake

★ Ottawa on March 4 made the long awaited announcement of tax adjustments intended to help gold mines offset the reduction in the price of gold from $38.50 to $35 an ounce which accompanied the return to dollar parity last July. These tax changes will benefit marginal mines but will leave unaffected the largest part of the industry. Mine operators who make a profit of $4 an ounce or less are allowed complete tax exemption as well as an increased allowance for depletion. Mines that have been brought into production since Jan. 1, 1946,

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Canada *(continued)*

will also benefit by the new policy, which was stated to be an emergency measure that will be subject to review and may be altered or revoked as conditions change. While waiting almost eight months for Government assistance in easing its problems, gold mining has shown a decline to a point almost 50% below the level of five years ago.

The emergency relief program as announced by the Minister of Finance consists of three measures: (1) depletion allowance for gold mines is increased from 33 1/3 to 40% of profits earned after Jan. 1, 1947; (2) the amount allowed as depletion for gold mines shall not in any case be less than $4 an ounce (formerly, it was $2 an ounce) and is intended to benefit those mines the profit margin of which is less than $10 an ounce; (3) gold mines coming into production after Jan. 1, 1946, will be relieved of the requirement, for a three-year period, of write-offs for depreciation and preproduction expenses.

★ The Atomic Energy Control Board is to get $5,573,000 for the Chalk River project under the budget of almost two billion dollars for the fiscal year beginning April 1, as announced on March 4 by Finance Minister Douglas Abbott. This is the first large sum to be asked for atomic development in Canada, and in the next few years the funds required are expected to increase. Uranium production at Great Bear Lake is secured by a Crown company. In the next fiscal year three million dollars more than in any previous year will be spent by the Department of Mines and Resources. Major projects include geological and topographical surveys, building a road from Grimshaw to Great Slave Lake, and construction work in the Yellowknife area.

★ Primary copper, antimony, pig iron, and asbestos are reported by the Department of Trade and Commerce to be in short supply. The exportable copper surplus has been committed to the end of the year, with Britain to receive 75%. No new orders are being accepted and deliveries on orders for old accounts are subject to delays up to 18 months.

★ Developments of major importance are now taking place in the Labrador-New Quebec iron ranges and in the northern Manitoba nickel-copper area centering around Lynn Lake (See Manitoba news). To give access to the various iron deposits located within the area drained by the Ashuanipi River and Grand Falls, in Labrador, work is to start on a railroad survey of a 375-mile right-of-way to the new iron country from the Gulf of St. Lawrence up the Moisie River and across the height of land. John Knox, consulting engineer of Hollinger North Shore Exploration Co., reports that diamond drilling is planned this

year on the Goodwood iron deposit, which now has an indicated 225,000 tons per vertical foot and a maximum width of 1,200 ft. Northwest of the Goodwood, the Eclipse deposit, explored by test pits, has surface dimensions which indicate 155,000 tons per vertical foot. In the Partington area, where the No. 1 deposit is to be drilled, the No. 2 deposit has an indicated potential of 57,800 tons per vertical foot. This summer it is proposed to use chopping to investigate the Ferriman deposits, where diamond drilling proved unsatisfactory in former operations.

ONTARIO

★ Of the four new gold-mining areas in this province now under active development, the east extension of the Red Lake field is of major importance. Although the Howey mine was first opened up 23 years ago, followed by development of the McKenzie, Madsen, and Cochenour-Willans mines, the camp has recently taken on new life. Campbell Red Lake Mines has completed sinking its four-compartment shaft and is doing lateral work on four levels. Other new producers will soon be reported in the camp, where more than $48,000,000 in gold has already been recovered.

★ The projected easterly extension of the Porcupine belt has been attracting considerable attention for the past two years. Highway construction east from Matheson to the Quebec border led to increased activity this winter by Newfield Mines, controlled by Dome, and by Wright-Hargreaves. Deep overburden has made progress slow and expensive.

★ In the O'Sullivan Lake area, 25 miles northwest of Nakina, Osulake Mines has indicated an orebody as the result of drilling last summer, financed by McWatters Gold Mines, Graham Bousquet, and others. Donald F. Hurd is president and mine manager; George Dimitrieff is consulting engineer. Considerable work has been done on adjoining properties in this area, and a road has been built to give access to the railroad.

★ The fourth new area, Groundhog River, about 50 miles west of the Porcupine camp, has also seen considerable activity. The original discovery by Joe Burke was followed by staking through Keith and Penhorwood townships. Joburke Gold Mines reports more than 23,000 ft. of diamond drilling on its property, located about two miles from the railroad. It is stated that 12 properties in this area have a total of 17 diamond drills in operation, and other companies have announced plans for drilling later this spring. Dr. E. G. Bishop, consulting geologist for Joburke, and C. Robertson, in charge of work on the adjoining Hoodoo Lake Mines, are following consistent plans for testing the known vein system. Values of $11.12 over a width of 59 ft. and $7.30 across 11.5 ft. have been re-

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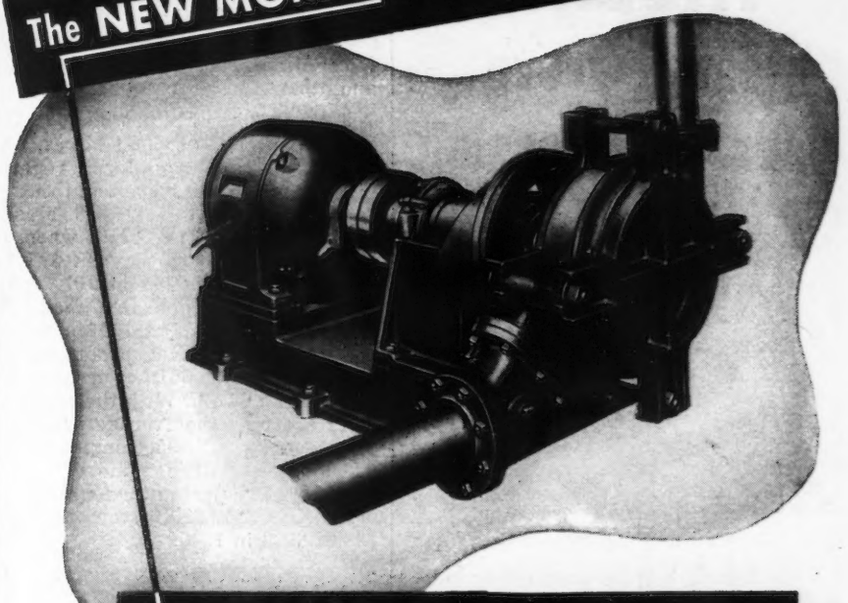

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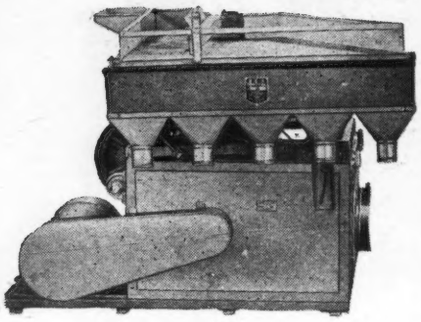

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Canada (*continued*)

ported on the two properties, where promising structure has been exposed for a length of 900 ft. Other active operators include Garnet Gold Mines, Wejack Mines, Hoyle Mining Co., and its subsidiary Keithgold Mines, in addition to Penwood Gold Mines, Purdy Mica Mines, Groundhog Gold Mines, and others.

★ Jules R. Timmins, president of Hollinger Consolidated Gold Mines, Canada's leading gold producer, reported that in spite of an increase in the volume of ore from 1,007,286 tons in 1945 to 1,118,955 in 1946, when the average value dropped from $9.16 to $8.97 a ton, the action in July reducing the value of gold in Canada had lowered income about half a million dollars in 1946. Net profit for the year was $1,732,651, compared with $2,126,302 in 1945. With the continued labor shortage the average number of employees was 2,295, compared with 3,000 required. The value of ore reserves at $35 per ounce for gold was reported at $81,892,314, compared with $85,039,033 in 1945.

QUEBEC

★ A joint request by Noranda Mines and Local 688 of the International Union of Mine, Mill, and Smelter Workers (CIO) has led to the appointment of a conciliator to settle a dispute over rehiring men. The official, Leon Trepanier, arrived at Noranda March 5 and began his investigation of the alleged discrimination. The Noranda strike, which started Nov. 22, 1946, came to an end Feb. 10.

★ A new company, Mistassini Lead Corporation, Ltd., has been formed by Dome Exploration Co. (Quebec), Ltd. Of the ground staked last year by Mistassini Explorations Ltd., 84 claims have been taken over by the new company, which is to be managed by Dome, and an additional 15 claims have been staked to protect the strike of the lead ore occurrences near the northeast end of Lake Mistassini. Plans have been announced for shipping a diamond drill by air to the property after the break-up. The property is about 90 miles northeast of Lake Chibougamau.

★ Shaft sinking on the three adjoining properties of Buffadison Gold Mines, Bevcourt Gold Mines, and Regcourt Gold Mines, east of Val d'Or, has been followed by active development work at two of the mines. Buffadison has a 980-ft. shaft and, by the end of March, expects to be working in the ore zone on four levels. Of the three zones tested by surface diamond drilling, the south structure grades $21.70 across 3.4 ft. for a length of 800 ft.; the north structure averages $16.45 for a width of 5.7 ft. and is 600 ft. in length; the other zone grades $21.70 for a length of 400 ft.

The Bevcourt shaft is down to 750 ft., and the main structure is expected to be reached before the end of March on the 700-ft. level. Work is also in progress on the 500-ft. level. Surface diamond drilling on the main ore zone intersected $11.75 across 17.5 ft. and $41.15 across 4 ft. at a point 200 ft. from the shaft.

The Regcourt shaft is to be completed in April at a depth of 500 ft. Down to 400 ft. the shaft intersected three separate gold-bearing zones ranging up to 3 ft. in width and of good grade. A vein structure was also intersected in station-cutting on the 400 level.

Buffadison is under the management of Andrew Robertson. Hal S. Wilson is consulting geologist and J. Lorne Jowsey is mine manager of both the Bevcourt and Regcourt mines.

MANITOBA

★ Diamond drilling of the "L" anomaly at the Lynn Lake property of Sherritt Gordon Mines, Ltd., is gradually outlining the size and attitude of the orebody. To date seven vertical holes at 50-ft. intervals have been drilled in the following pattern: the first hole, No. 160, is flanked by holes Nos. 164 and 165 west and east respectively; holes Nos. 163 and 161 are south of No. 164; hole No. 162 is north of hole No. 164; and hole No. 166 is east of the former.

The following is a tabulation of results obtained in the first seven holes: Hole No. 160, from 37 ft. to 639 ft. averaged 4.83% nickel and 1.63% copper. Hole No. 161 yielded no ore. Hole No. 162 from 82 ft. to 149 ft. averaged 3.11% nickel and 1.74% copper, and from 269 ft. to 293.5 ft. averaged 3.72% nickel and 1.00% copper. Hole No. 163 yielded 3.26% nickel and 3.59% copper from 37 ft. to 54 ft.; from 81 ft. to 89 ft. averaged 3.68% nickel and 0.4% copper; and from 155 ft. to 169 ft. yielded 5.28% nickel and 1.29% copper. Hole No. 164, from 28 ft. to 166 ft., averaged 4.79% nickel and 1.58% copper; and from 166 ft. to 191 ft., 0.56% nickel and 1.93% copper. Hole No. 165, from 99 ft. to 291 ft., averaged 3.99% copper; this average includes several low sections and the hole is reported to be in ore at 504 ft. Hole No. 166, from 95 ft. to 322 ft., averaged 4.90% nickel and 1.48% copper; from 430 ft. to 468 ft., 1.13% nickel and 0.74% copper; from 468 ft. to 495 ft., 5.21% nickel and 1.91% copper. Massive sulphide continued to 622 ft. Hole No. 167, from 39 ft. to 104 ft., averaged 4.99% nickel and 1.51% copper. This hole is stated to have continued in massive ore to 167 ft., followed by intermittent sections of sulphides and hornblendite.

★ The success achieved by Sherritt Gordon has naturally accelerated staking and exploration by other interests. The Granville Lake area has been the scene of a staking rush during the last month, the extent of which will not be known for several weeks because of the time interval between staking and

recording in this remote area. International Mining Corporation (Canada), Ltd., and Conwest Exploration Co., Ltd., are forwarding drills to their mutual holdings and have formed a new company to be known as Nicola Mines, Ltd. Other organizations which recently staked or acquired ground in the district include Denison Nickel Mines, Ltd., and Cheskirk Mines, Ltd. Geophysical surveys are in progress on these holdings.

BRITISH COLUMBIA

★ New ore-purchasing schedules have been announced by Consolidated Mining & Smelting Co. of Canada, Ltd. These will enable shippers of ore and concentrate to obtain prompt settlement on the basis of metal prices as published by *Engineering and Mining Journal* for the week of arrival of shipments at the Trail smelter. Small operators or leasers who cannot finance the construction of a mill will benefit from another provision of the schedules calling for payment for the zinc content in lead ores. Mine operators are warned at the same time that it will still be more advantageous to separate lead-zinc ores. Improved prices for base metals and the recent upward trend in Canadian price ceilings have made the concession possible, according to the company's announcement.

★ Polaris Taku Mining Co., Ltd., Atlin district, produced 1,753 oz. gold during January, an increase of more than 200 oz. over December. A diamond-drill intersection of 12 ft. of ore averaging 0.873 oz. gold per ton has been obtained on the "B" level, 300 ft. above the main haulage level in a section of the mine hitherto unexplored.

★ Twin "J" Mines, Ltd., commenced production at its Mount Sicker, Vancouver Island, properties on March 1. Only two-thirds of the 150-ton mill capacity will be utilized until more power is available. A ready supply of gold-copper-zinc ore has been developed and will be treated by selective flotation, the copper concentrate being shipped to the Tacoma smelter and the zinc concentrate to Trail.

★ Encouraging results of development work have been reported by H. T. James, president and managing director of Vananda Mining Co., Ltd., subsidiary of Pioneer Gold Mines of B. C., Ltd. Recent diamond drilling in the Little Billie mine, Texada Island, has indicated the persistence of known orebodies and disclosed the existence of new orebodies at a depth exceeding 100 ft. below present limits. Core lengths ranging from 5 to 39 ft. have given an over-all average of 0.26 oz. gold and 2% copper per ton. The ore is principally bornite with some chalcopyrite and is particularly amenable to treatment, being capable of producing a 45% copper concentrate.

★ The "27" vein, previously developed on the 19-, 21-, and 25-levels, has been

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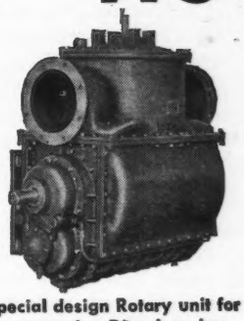
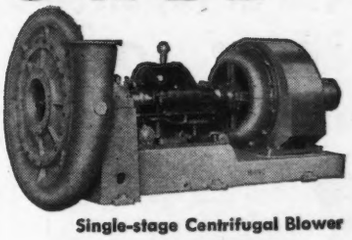
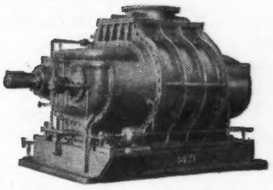
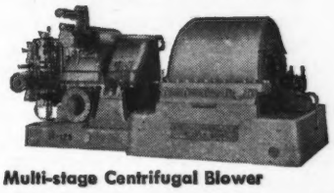
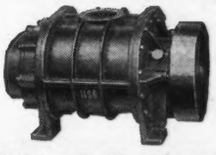

Special design Rotary unit for scavenging Diesel engine


Single-stage Centrifugal Blower


Rotary Positive Gas Pump

Positive Displacement Meter


Multi-stage Centrifugal Blower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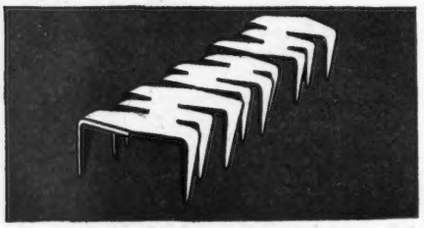

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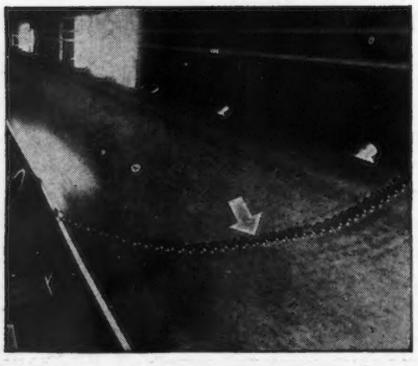

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Canada *(continued)*

intersected by a crosscut on the 23 level of the Pioneer mine, Bridge River district. The intersection of 2.8 ft. of ore assaying more than 0.5 oz. gold per ton was obtained at a point which could have been outside the ore zone, according to results obtained on other levels, H. T. James, managing director, states.

★ Atkinson Dredging Co., Ltd., in the Similkameen district, has received authority to issue 2,500 preference bonds bearing 6% interest on a par value of $100 each, thus increasing capital to $1,250,000. Gold Production Syndicate, Inc., a subsidiary, has been incorporated in the State of Idaho to develop leases held in the Boise basin. Dredging equipment, valued in excess of $100,000, will be put to work this year on the Tulameen River above the town of Princeton, where the company holds 53 leases divided into four groups, with estimated dredgeable reserves of 215,000,000 cu.yd. of gold- and platinum-bearing gravel. Extensive testing has shown 9,405,945 cu.yd. to contain indicated value of $4,396,470, equivalent to 46.75c. per cu.yd.

★ Officials of Hedley Monarch Gold Mines, Ltd., have reported spectacular values from the company's property in the Osoyoos district. Samples obtained from a shear zone traced for 530 ft. on the surface have yielded as high as 366.1 oz. gold and 63.0 oz. silver per ton. A trench 26 ft. long showed a width of 16 in. of ore averaging 18.1 oz. gold per ton.

★ J. C. Dumbrille, general manager of Highland-Bell, Ltd., reports a material increase in the size of an ore body in the southeast end of the company's mine at Beaverdell, in the Greenwood district. To the eastward another body of ore shows a width of 20 ft. containing large quantities of silver. At a distance of 1,000 ft. to the westward, drilling from the 700-level has indicated a vein of good-grade ore in ground hitherto unexplored. The 7-level crosscut has been extended to reach a large block of ore previously outlined by diamond drilling. A short diamond-drill hole from the crosscut intersected 13 ft. of ore assaying 65.0 oz. silver per ton. Regular ore shipments are being made to the Trail smelter.

★ The charter of Creston Gold Mines, Ltd., formerly a subsidiary of Quebec Gold Mining Corporation, has been taken over by Rossland Mines, Ltd. The new company, capitalized at 3,000,000 shares of no par value, holds 103 claims, on location and option to purchase, in the geologically favorable area immediately south of the properties of Consolidated Mining & Smelting Co. in the south belt of the Rossland camp. Engineers have recommended a magnetometer survey to be followed by diamond drilling. This will be started under the direction of Dr. A. R. Clark, who is associate professor of physics at the University of British Columbia, and S. Bruce, mine manager.

★ A 500-cu. ft. compressor has been installed by Granby Consolidated Mining, Smelting & Power Co., Ltd., at the Hewitt-Galena Farm property, held on option in the Slocan district. Several earlier workings were reclaimed and reconditioned during 1946. Work in 1947 will include the extension of drifts and driving of raises between the 10- and 8-levels.

★ Utica Mines (1937), Ltd., plans to erect a 100-ton mill on its Slocan district property during the coming summer. During the past year work has been directed to blocking out ore between the 5 and 4 levels, 350 ft. apart vertically. Some high-grade ore was sacked and shipped to the Trail smelter.

YUKON

★ A vigorous campaign to obtain construction of an all-weather road from Whitehorse to Dawson was initiated last winter by dredge operators in the Dawson district and the Dawson branch of the British Columbia and Yukon chambers of mines. The project has now been endorsed by the executive committee of the Chamber at Vancouver, which has brought the matter to the attention of the Minister of Mines and Resources at Ottawa.

CHILE

Andacollo resumes — Allis-Chalmers may build Paipote smelter —Gold strike near Copiapo

★ Cia. Minera de Andacollo, in the famous gold field near La Serena and, owner of the Churrumata orebody, is again operating after a year's shutdown to repair the mill and develop the mine for cheaper mining. Gold treated in the new 70-ton mill will be recovered by amalgamation and flotation.

★ The Government has sent a bill to Congress that liberates small miners from most of the taxes now in effect. The objective is to encourage small mining operations, which have been declining despite rising metal prices. A second bill sent to Congress reserves to the State the following substances: Guano, petroleum, natural gas, radioactive minerals, nitrate, and iodine and its salts. Other legislation under discussion would permit the Caja de Credito Minero to buy 20 metric tons of fine silver for coinage of 10- and 20-peso pieces. No silver coins are now in circulation in Chile.

★ Egyptian capital is interested in building in Chile two new nitrate plants to supply Egyptian needs of natural nitrates. The mattter is being considered by the Secretaries of the Treasury and Economy, as well as

by the Nitrate Authority, a technical Government department supervising Chilean production of nitrates and iodine.

★ Considerable interest is being taken in the discovery of a new vein in the Elisa gold mine, near Copiapo, that runs 27 oz. per ton. The happy owner of the property is an Egyptian merchant.

★ The British-Latin Import Corporation, a company formed by several important British manufacturers, has recently offered to trade credits for £2,000,000 in farm machinery for Chilean nitrates. The Ministry of Economy is reported greatly interested in the offer.

★ It was reported in Santiago recently that Luis Bossay, Minister of Economy, had entered negotiations with Allis-Chalmers Mfg. Co. to design and construct a copper smelter to be erected at Paipote, near Copiago. Plans had been made before the war to build this smelter, but were dropped during hostilities. President Gonzales Videla is anxious to have this smelter built during his administration, and the large loans from Argentina now make the project feasible.

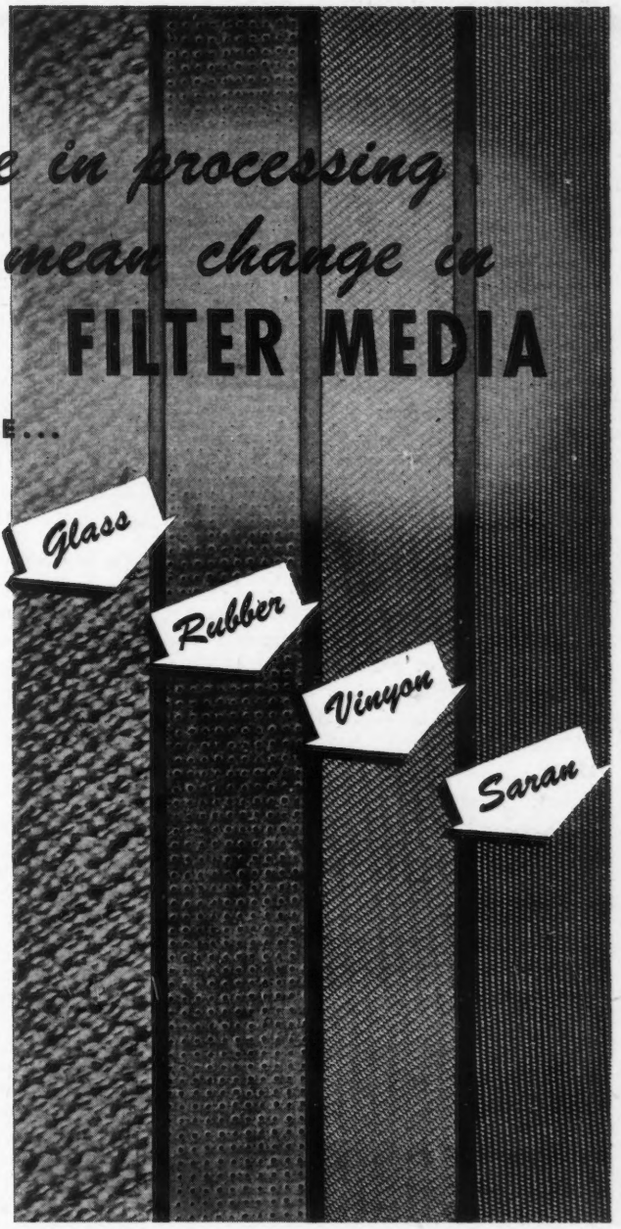
VENEZUELA

Gold mines have bad year — New gold fields in deal with Ventures, Ltd.—Iron developed

★ No relief was felt during 1946 for Venezuelan mines in the way of obtaining supplies and equipment. The political and economic climate of the country has changed for the better, but gold mining, for example, had its worst year since 1930. All producing gold mines ran at a loss for most of 1946, New Goldfields of Venezuela, the largest producer, reporting an operating loss of $193,716 for the past fiscal year.

★ An option has been taken by Ventures, Ltd., Canadian mining and exploration company, on the New Goldfields' properties. A new company, called Guayana Mines, Ltd., has been formed and the known orebodies are being tested at greater depths than heretofore reached. New Goldfields will retain a one-sixth interest in the enterprise if mining is carried on, but if Ventures drops the option, the properties revert to New Goldfields. If more ore is found at depth, the situation of the entire district would be changed.

★ The French Mocupia company sought a loan from the Venezuelan Government early in 1946, and when this was refused, managed to obtain some of its prewar reserve funds from the French Government in order to continue operating. The mill is being rehabilitated and the mine further developed.



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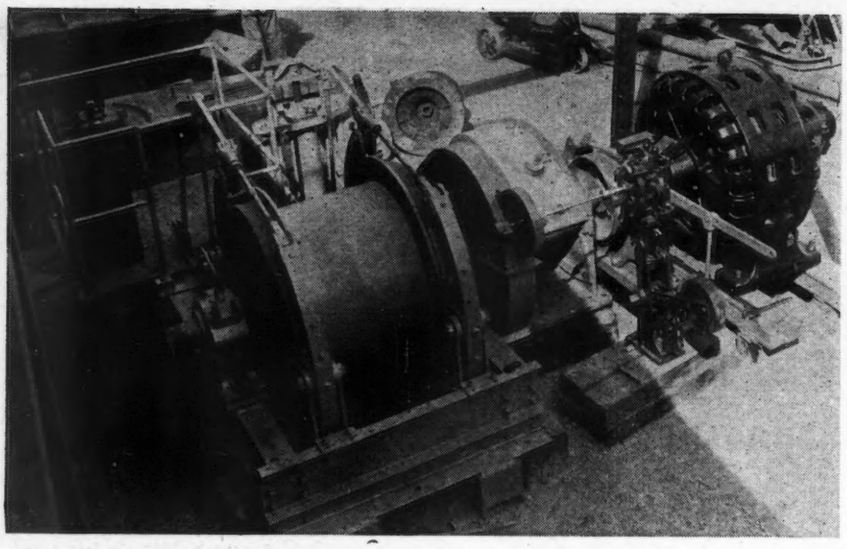


THE MAN HOIST SHOWN was built in the shops of the Unificada mine, one of the Hochschild group of properties, at Potosi, Bolivia, under the supervision of Henry Grynberg, master mechanic. Because of delivery complications, it was impossible to obtain a factory-built hoist. The installation of the unit is underground, in the new Val De Camp shaft, at an elevation of 14,000 ft. The hoist is constructed with parallel-movement post-type brakes, one pair actuated by counterweights with air-cylinder release, the other hand-operated for emergency use. Electric eyes are placed in series, with the no voltage relay for overwind cutout. Rope speed is 600 f.p.m. The motor is 150 hp.

Venezuela *(continued)*

★ The Venezuelan-owned gold mine, Vuelven Caras, last year obtained a loan of $120,000 from the Venezuelan Government to meet existing obligations and to buy a small cyanide mill.

★ Oliver Iron Mining Co. is considering plans for an aerial survey of the whole Imataca area, which the company has been exploring for iron ore-bodies this past year. The subsidiary of Bethlehem Steel Co. at El Pao is continuing development, and the first shipment of ore may be made next year.

PHILIPPINES

Benguet and Balatoc plan mill operation this summer—Things look well for Lepanto Con.

★ In rehabilitating the Benguet and Balatoc mines, the haulage tunnel from the 4,000-ton mill to the Keystone vein of Benguet is in more than 7,000 ft. and the Balatoc tunnel is completed. Milling is scheduled to begin late in the summer, an earlier start having been prevented by delays in getting machinery from the States.

★ Atok Mining Co. began milling again in March. The company operates a 400-ton mill on ore mined on a 50-50 basis in the Big Wedge mine. An increase to 800 tons is planned for later in the year.

★ Baguio Gold's activities have been restricted to cleaning up around the mine and estimating cost of restoration. Damage to the mine workings appears less than feared, although the mill and power plant are a total loss.

★ Lepanto Consolidated plans reconstruction of its 1,000-ton mill, and V. E. Lednicky has been in San Francisco expediting shipment of new equipment. Finances for reconstruction have been adequate, thanks to the sale of 5,000 tons of copper concentrate left behind by the retreating Japanese. The mine property was left in excellent condition. The mill will use bulk flotation to recover a 35% copper concentrate and tailings will be cyanided for gold.

★ Shipments of chrome ore from Masinloc have been stepped up to more than 15,000 tons per month. John Smeddle, formerly with Demonstration, has been general superintendent at Masinloc since February 1946. The demand for refractory chromite continues good.

★ H. Gasser, president of Tambis Gold Dredging, announces that the company resumed operations in January. Production for the first 15 days was 205.8 oz. of gold. The company's dredge, which was about 125 km. south of Surigao, was little damaged during the occupation. Before the war, the company had mined for 14 years, with a yearly output of about $125,000 from gravel averaging about 21c. per cubic yard.

★ Options on the ground north and south of the Mindanao Mother Lode Mining Co. have been taken by a prominent American mine development company. Detailed geological studies have already been made.

★ Little rehabilitation has thus far been done in the Paracale field. No decision has yet been reached on reconstruction of the Coco Grove dredges. One of the two boats is believed a total loss as a result of bombing attacks; but the other, the "Mary Angus", is floating and could be repaired for about $100,000. Heavy equipment is in good condition, but motors, pumps, electrical equipment, jigs, and stackers are badly rusted or dismantled. Good reserves of gravel remain.

★ Mining men were greatly pleased by President Roxas' assurance that he favors free export of gold from the Philippines. This will permit sale of gold on world markets, where it will probably bring more than the statutory price of 70 pesos. Gold miners believe they may obtain $40 to $45 per ounce.

RUSSIA

Ukraine iron mines developed—Mines restored at Kursk—Lena gold miners decorated

★ The Krivoi Rog iron ore basin, in the Ukraine, which suffered heavily during the German invasion, is to be completely restored this year, and new mines will be developed. Eventually, 35 mines will be producing an annual tonnage of 23,000,000 tons of iron ore. Work has begun on the Basin's first concentrator, an electromagnetic separation job that will treat ores of 35 to 40% iron. Open-pit mines are being developed where possible.

★ At the end of the present Five Year Plan there will be no areas of eastern Siberia not surveyed by Soviet geologists, according to the Soviet press. Chief attention will be given iron, coal, and manganese prospects.

★ Mining development has been resumed in the area of the magnetic anomaly in the Kursk region of the European part of the U.S.S.R. Deep seams of ore up to 60 meters thick are said to carry up to 60% iron. Shaft sinking in the area has been hampered by large flows of water and by a layer of quicksand. The Korobkov mine, partly developed, was flooded and its surface installations were wrecked by the Germans, but it is now nearly restored.

★ The Order of Lenin, highest Soviet decoration, was recently awarded the Lena Gold Trust for successful completion of its production program. The award marked also the centennial of the Lena gold field. Among five employees of Lena to get the Order of Lenin was Arkhip Popov, leading Stakhanovite miner at the fields, where he has worked for 12 years (apparently during the war).

MEXICO

Silver coinage to be resumed in Mexico—Golden Girl asks leave to shut down—Union to meet

★ Beginning probably in the early spring, Mexico will resume coining one-peso silver pieces and begin coinage of a new five-peso silver piece. This move, it is believed, will aid the economy by helping the mining industry and by encouraging saving among the people. In announcing this, Lic. Ramon Beteta, Secretary of Finance, also said that he disapproves excessive and burdensome taxation. This led to hope in mining circles that the Aleman government may do something to lighten the tax burden borne by Mexico's mining industry. (See *E.&M.J.*, p. 76, June 1946.)

★ Contending that it can no longer operate at a profit, Cia. Minera the Golden Girl, Sinaloa, has asked the Federal Board of Conciliation and Arbitration for permission to suspend operations. Cia. Minera de Nochebuena, Zacatecas, asks permission to shut down temporarily because of inability to get dynamite.

★ The National Miners Union will hold its convention on May 2 in Mexico City, according to Agustin Guzman V., secretary general. He says the prime purpose of the meeting will be "to make the syndical march more progressive and more in harmony with present world conditions."

AUSTRALIA

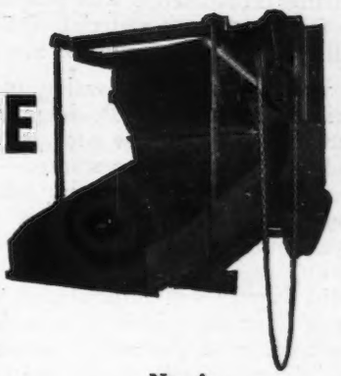
Wiluna to begin developing Mt. Charlotte leases — Broken Hill companies plan exploration

WESTERN AUSTRALIA

★ An important move in the State's gold-mining industry will be the start of development work by Wiluna Gold Mines, Ltd., on the Mount Charlotte leases at Kalgoorlie. The company has run out of ore in the mine at Wiluna, where future work will be cyanidation of tailings. The Mount Charlotte leases have been held under options for several years, but wartime conditions have prevented any work being done. Prospecting by diamond drill by the vendor company has indicated the existence of more than 1,000,000 tons of ore with a value of approximately 5 dwt. gold per ton to a moderate depth. If expectations are confirmed, the intention is to remove as much of the mining and treatment plant as can be utilized from the Wiluna mine to the new property.

★ Gold Mines of Kalgoorlie, Ltd., is one of the youngest companies oper-

● *Right* SIZE
● *Right* TYPE
● *Right* PERFORMANCE



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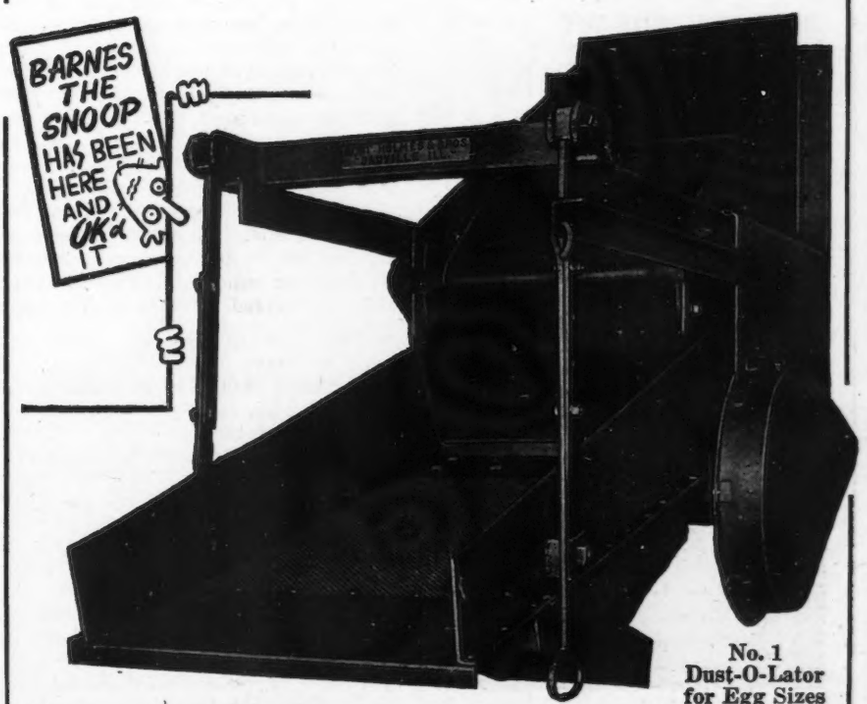

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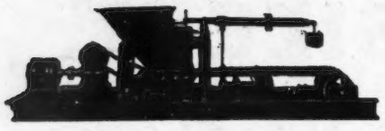

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Australia (*Continued*)

ating in the field. Its formation was made possible by the increase in the price of gold in the last decade, and a number of abandoned leases on the southeastern side of the Kalgoorlie field were taken up and have been successfully developed. In the last year the mine treated 116,601 tons of ore for the recovery of 27,808 oz. of gold. Labor was more plentiful, and it was possible to complete 7,378 ft. of development work and 4,929 ft. of diamond drilling. The average assay value of the ore exposed in exploratory and developmental work was 7.0 dwt. gold per ton. Ore reserves are estimated at 526,660 tons assaying 5.1 dwt. gold per ton. The average mill throughput was 9,000 tons of ore per four-weekly period, and the average grade of ore treated was 5.3 dwt. per ton. Value of residues was 0.43 dwt. per ton and the recovery was 92%. Milling practice is fine grinding, flotation, roasting the concentrate, and cyanidation of the calcine. An important feature of treatment is pre-cyanidation, or cyanidation of the ore prior to flotation, a development in practice which was pioneered by this company. Working costs per ton in Australian currency were: mining and treatment, 34.22s.; development and redemption, 4.50s.; total, 38.72s.

★ One of the solidly established mines of the Kalgoorlie gold field is North Kalgurli (1912), Ltd. In the company's last annual report, production is shown at 108,423 long tons of ore, which is an increase on the previous year. Recovery was 33,681 oz. of gold; average grade of ore milled was 6.213 dwt. per ton. This value compares with an average of 6.235 dwt. per ton for the ore reserves in those sections of the mine from which the ore was won. Ore reserves were estimated at: positive ore, 1,026,530 tons with an average grade of 6.13 dwt. gold per ton; 423,370 tons of probable ore, assaying 5.5 dwt. per ton. Working costs were: mining, 12s. 10d.; treatment, 12s. 10d; total costs, 33s. 6d.

NEW SOUTH WALES

★ Broken Hill mining companies are planning extensive interest in the exploration of the country's mineral resources. North Broken Hill, Ltd., intends to erect a milling plant for the treatment of sulphide copper ores on an extensive field containing small mines, in the north of the State. The proposed undertaking is reported to be on a community basis, but details are lacking. Zinc Corporation, Ltd., and New Broken Hill Consolidated, Ltd., also have plans for mineral exploration in the Commonwealth. Large areas of the Broken Hill district have been aerially photographed as a preliminary step to geological mapping. Much country has been taken up and is to be examined and prospected by modern methods, and a geophysical survey is to be undertaken immediately, under the direction of the chief geologist of the Zinc Corporation.

On one portion of the large area, diamond drilling has already started. Much of the country was prospected during the early years of the field, and a very widespread mineralization was shown to exist, but beyond the main lode the ore occurrences were of little commercial importance to the shallow depths attained.

The history of the northern and southern ends of the Broken Hill lode indicates that the deeper geology of the surrounding areas demands close examination, for which work the operating companies possess the necessary capital. The Zinc Corporation holds a large interest in a concession over the Ediacara lead field, in South Australia, which is extensive, but was not commercially successful, and diamond drilling is now being carried out. In Queensland, a prospecting concession at Mount Garnet, covering a copper area, is to be examined.

TASMANIA

★ Electrolytic Zinc Company of Australasia, Ltd., is principally engaged in the manufacture of metallic zinc at the works at Risdon, near Hobart, Tasmania. Concentrates, usually calcined before shipment, are obtained from the mines at Broken Hill, New South Wales, and from the company's own mines at Rosebery, on the west coast of Tasmania. During the company's last year, a total of 170,736 tons of concentrate was roasted, of which 35,094 tons came from the Rosebery mines and the rest from Broken Hill. The production of metallic zinc at Risdon works was 80,458 tons, which was an increase on the previous year's total, resulting from plant extensions, largely carried out under considerable difficulty during the war.

Zinc-plant residues are returned to the smelters at Port Pirie, South Australia, and in the year amounted to 41,147 tons, containing 1,875 tons lead, 285,525 oz. silver, and 1,210 oz. gold. The works also produced 226 tons of cadmium and residues containing 153 tons copper. Cobalt oxide amounted to 14 tons, a part of which was converted to sulphate. Other products comprised zinc sulphate, sulphuric acid, and superphosphate, which latter, together with mixed fertilizers, totaled 33,631 tons.

The company was severely hit by continued excessive taxation, which amounted to 9s. 7d. in the pound, and taxation on dividends in the hands of shareholders, estimated at 5s. in the pound, brought the total taxation figure to 11s. 10d. of each pound of profit earned. Under these conditions, and continued wartime controls, there is no incentive to employers or employees to the production of cheap consumer goods. President conditions cause low production at high cost, and it is impossible to effect improvement by reducing the cost of living. Until these facts are recognized by Government

and an intelligent and adequate reduction is effected in taxation, Australia's industrial future is gloomy.

AFRICA

Lead orebody outlined by work in Tanganyika—Miners still striking—Tax relief granted

★ New articles of association were adopted late in February by Uruwira Minerals, which owns the Mpanda lead mine, in Tanganyika Territory. (See map herewith.) The concern is now a public company, with share capital increased to £1,250,000. Union Corporation will probably take over technical administration of the mine, and results of preliminary surveys made by that group are sufficiently encouraging to warrant spending £1,000,000 on thorough prospecting, underground development work, and operation of a pilot concentrator. The Government of Tanganyika has entered an agreement with Uruwira Minerals to build a railroad 130 miles long from Kaliua, on the Central railway to Dar Es Salaam, to Mpanda. Shareholders in Uruwira include the British Metal Corporation, New Consolidated Goldfields, and Union Corporation.

★ Writing in the *Crown Colonist* for January 1947, Sir Edmund O. Teale gives details of the Mpanda lead mine and surrounding territory. He states that the Mpanda field first became known in 1936, when J. de le Valle Poussin, a Belgian geologist, discovered placer gold there. Subsequent exploration outlined a promising mineral area, even though remoteness of the region made development difficult. The area is about 150 miles southwest of Tabora, a station on the Central Railway from Lake Tanganyika to Dar Es Salaam, but a rail connection, 130 miles long, will be built to Kaliua. A motor road runs between Mpanda and Uvinza, another rail station. About 10,000 ft. of diamond drilling and some underground development indicate an orebody of at least 2,000,000 tons of workable lead ore plus gold and silver in significant amounts. Zinc minerals are not present. Rock formations of the field consist mainly of gneisses and schists belonging to the basement complex of Archean age. Well-mineralized quartz reefs carrying iron, copper, and lead sulphides are found in two shear zones, a north-south and an east-west. The Mpanda lead orebody lies at the junction of the north end of the former and the west end of the latter. Present plans aim at an annual production of about 25,000 tons of lead, 22,000 oz. of gold, and 1,400,000 oz. of silver

★ The strike of the Mine Workers Union, which has seriously hampered

(*Continued on page* 154)

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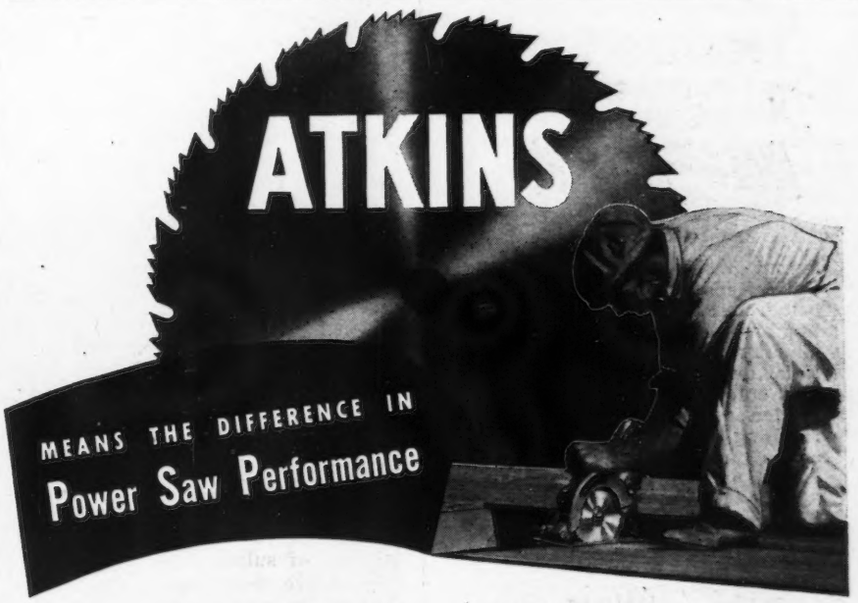

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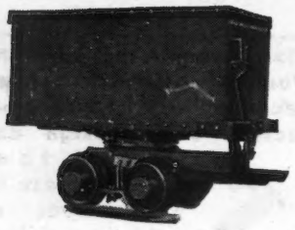

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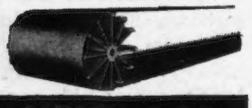

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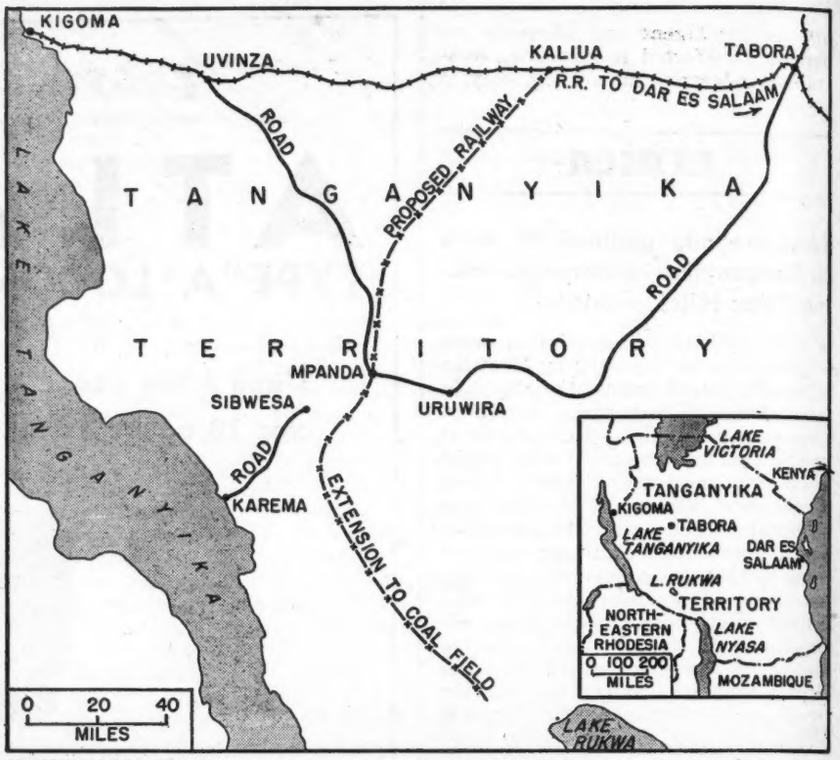

NEWEST LEAD MINE reported in recent years lies in this area in Tanganyika Territory near Mpanda. Uruwira Minerals Corporation, under technical direction of Union Corporation, plans to spend £1,000,000 developing the lead orebody and in pilot-plant work. *Map after Stanford, London.*

WOMEN SCIENTISTS ARE HELPING South African gold mine operators in the solution of underground problems. The Transvaal Chamber of Mines Timber Research Laboratory employs women mycologists and chemists to find ways of preserving timber and fabrics used underground. The picture shows a women phyto-chemist inspecting timber covered with an unidentified fungus, called Father Christmas by miners.

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Africa (*continued*)

production of Rand gold mines since Jan. 27, appeared settled on March 12, when the men agreed to return to work. However, the returning men found that their leaders were not to be reemployed, and most of them promptly walked out again. The issue revolves about control of the union, and no question of wages or working conditions is involved. The strike cut the Rand's February output of gold to 572,720 oz. from January's 972,212 oz. Operations were at a daily loss of about £11,000 during February.

★ Expected taxation concessions were made to Rand gold mines in the budget for 1947-48 announced recently by Mr. Hofmeyr, South African Minister of Finance. The tax formula introduced last year has been altered to reduce by about 10% the tax percentage applied to each mine. However, only the high-grade mines will benefit from the formula change, because low-grade mines, beset by rising costs, have been paying little or no tax under the formula as it was. Further changes include a new amortization rate for mines of 22½% per year instead of the life-of-mine rate formerly used. The excess-profits duty is stopped and the trade profits special levy is abolished.

★ Geduld No. 2 borehole, about ¾ mile east of the famous Geduld No. 1, recently cut the Basal Reef in a first deflection at 4,886 ft., yielding an assay of 1,904 dwt. over 6.58 in. The original intersection at 4,865 ft. ran 5.64 dwt. over 47.9 in. This second rich core lends weight to the belief that the Orange Free State holdings of Blinkpoort and Western Holdings may be the richest part of the gold field now shaping up there.

A.I.M.E. Meeting

(*Continued from page* 110)

was one of milling's biggest, yet potentially most rewarding, problems.

E. C. Bitzer, Colorado Iron Works, gave a frank and refreshing account of the development of the Akins classifier into a separatory vessel for sink-and-float work. Discussion brought out the fact that sink and float has been tried on the Rand's gold ore, but, to be successful, the process must separate ore of 2.74 sp.g. from quartz of 2.65 sp.g. at about 65 mesh.

In a session on grinding, Messrs. Myers, of Tennessee Copper, and Bond, of Allis-Chalmers, told of some interesting laboratory and plant work on use of rod mills as fine crushers. No disagreement was expressed with Mr. Myers' conclusion that rod mills look like the best bet for crushing 1-in. rock to ball-mill feed size.

Feature of a session on flotation practice was the outline by R. B. Barnes of the flame photometer developed in the laboratories of American Cyanamid Co. A sample, in solution, is poured into the gadget, and almost

immediately a galvanometer gives the assay in parts per million or other desired term. Operation depends on coloration of a flame, which affects a photoelectric cell. Most work thus far has been with Na, K, and Ca. One mill operator said he was now trying to hook this device into his mill circuit to give continuous recording of concentrate and tailing assays. Also featuring this session was a lively discussion of flotation reagents for potash minerals and for Tennessee as against Florida phosphates.

Conspicuously absent this year were papers on flotation theory, the only contribution being an attempt by Rogers and Sutherland, of Australia, to blow holes in the chemical theory of flotation. The chemical theorists present seemed undismayed, however, and discussion yielded no conclusions.

Shaped Charge

In a session devoted to the shaped charge Prof. Geo. B. Clark discussed the tests, variables that enter into the design and performance of the shaped charge, and other parts of his papers, "Behavior of Metal Cavity Liners in Shaped Explosive Charges," and "Studies of the Design of Shaped Explosives Charges and Their Effect in Breaking Concrete Blocks." W. T. Warren, general superintendent, National Tunnel & Mines Co., discussed the work done and results obtained since development and use of the preliminary shaped charge at the National Tunnel property, at Tooele, Utah. Following discussion, R. J. Mechin closed the session with the statement, "There appear to be two schools of thought on the matter; one of the theorists, and one of the operators. It would be well to consider more the practical aspects of the subject, and do more work in the mines proper than on concrete blocks." A resolution was passed at the end of the session calling for release by the War Department of data covering experiments and experience of the armed forces with shaped charges during the war years.

Large Core Barrels

Drilling with large core barrels was discussed at a symposium on March 19 in a joint session with the Industrial Minerals Division, with James A. Barr and R. D. Longyear presiding. Various manufacturers were heard from in respect to core-barrel standardization. The experience of the Bureau of Mines with oversize diamond core barrels was described (by J. R. Thoenen, of the Bureau) and the practice of the Omaha office of the U. S. Engineers in recovering cores between 2 in. and 10 in. diameter was detailed. Some desirable improvements in core barrels were discussed in a paper by G. D. Roberts. The work of the Reclamation Bureau with large barrels was the topic of a paper by R. F. Blanks, read by R. F. D. Crook.

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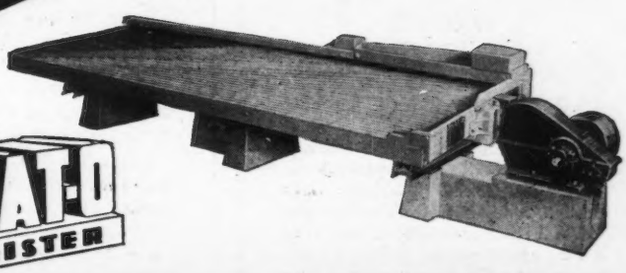

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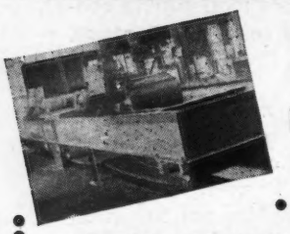

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A.I.M.E. Meeting

(*Continued from page* 155)

This matter was considered with respect to hard rock, to shattered imperfect rocks, to soils, and to concrete.

Drilling Gets Attention

Various aspects of drilling, in the main, and of blasting, to a lesser extent, were considered at Thursday's morning session on mining methods, W. R. Chedsey and A. H. Hubbell presiding. To the five papers on the printed program, a late-comer was added dealing with drainage in the Tri-State District, by O. W. Bilharz.

S. S. Clarke, general superintendent of the Eagle-Picher company's Tri-State zinc mines, described the step-by-step development of the company's caterpillar-mounted jumbo, as the outgrowth of an effort to conserve manpower at a time when production was being increased. The circumstance that the company already had some trackless mines in which trucks were used contributed in a measure to the adoption of crawler mounting. Drilling labor costs have been lowered from 38c. per rock-ton to 24c., this despite an increase in wages from $6.55 per 8-hr. shift in August 1943 to $9.03 in December 1946. In addition to the base pay, jumbo crews are paid a bonus of 8c. per rock-ton for all tonnage above the base.

Tons broken per drill shift with the jumbo are 130, compared with 58 with the post mounting; footage is 95.6, compared with 60.4, and tons per bit used is 10, compared with 6.5 previously.

Attention to the possibilities of mechanization of operations at the Bunker Hill mine, in Idaho, have made it possible for a three-man crew to advance 7x9 ft. headings consistently 8 ft. or more per shift, doing all the work of drilling, mucking, loading, and switching, according to R. S. Hooper, mine superintendent, in a paper that was read in the author's absence by Bernard Haffner, formerly with Bunker Hill but now with National Lead's McIntyre development, in the Adirondacks. These improvements include the development of a light, flexible, easily transported jumbo, equipped with pneumatic columns, that has cut the setting-up and tearing down time to an average of 1¼ hr. per shift, or 25% of the available working time; automatic-feed drills and detachable bits; and air lines of ample capacity. In cases headings have been advanced at a rate of over 10 ft. per shift.

At the time this paper was being written, two-man crews under a suitable incentive system were being tried. In slusher and scram drifts where no trackage is used, the pneumatic column jumbos are skid-mounted.

Shaft-sinking operations up to 50 deg. and raising up to 41 deg. have been done successfully with this equipment. Single pneumatic columns with standard arms are being tried in the stopes with drifter drills at present.

How Kennecott's Utah Copper Division has improved its drilling and blasting practice at the big open-cut mine at Bingham was told in a paper by R. H. Willey, assistant general drilling and blasting foreman, which was presented by Mr. Hubbell in the author's absence. Cubic yards per drilling-and-blasting man-shift was 2,773 in 1946, against 1,991 in 1937 and 1,856 in 1927. Footage per drilling man-shift was 41.3 in 1946, compared with 15 to 20 ft. in 1937 and 1927. The cost per 24-ft. hole (including labor, material, and powder) was $56.85 in 1946, $46.83 in 1937, and $39.86 in 1927. Over-all cost per 1,000 cu. yd. drilling and blasting was $43.08 in 1946; $46.84 in 1937; and $54.68 in 1927.

Drilling today is still done with tripod-mounted drills, the machines, however, being auto-feed Ingersoll-Rand DA-35 drills, using 3-in. I-R Type A-2 detachable bits, compared with I-R F-24 piston drills formerly employed.

Instead of the older cap-and-fuse, Primacord is used for blasting. The powder has been Hercules Gelamite No. 1, a 65% weight strength semi-gelatin, but latterly so-called Hercomite Bag, a free-flowing high-ammonia powder, has been proving very successful.

Hard-Surfaced Bits

Development of a hard-surfaced rock bit for drilling oil shale on a commercial scale was described by T. Ertl, J. R. Wagner, and E. Burgh, all of the Bureau of Mines, in a paper summarized by Mr. Ertl. For the work an H-type Timken detachable bit was hard-surfaced with Acetylene-Tube Borium. The technique has progressed to the point where good bits can be produced consistently. Six 18-ft. holes, or 108 ft. of rock, can now be drilled with a single bit, thus surfaced, in oil shale without appreciable reduction in drilling speed. After 200 ft. of drilling a loss of 30% in drilling speed and of 1/64 to 2/64 in. in gage is experienced. Further loss of speed is caused by wear of the reaming points and the bit threads. The drilling was done with a Gardner-Denver wagon drill.

J. D. Warner, captain of Oliver Iron Mining Co.'s Soudan mine, on the Vermilion Range, in Minnesota, presented an up-to-date paper on the drilling of the hard Soudan ore, his description including that of the mining method. After sketching the history of drilling at the mine he focused attention on present practice, describing the hydraulic-, electric- and air-operated core drills in use today. Following the breasting operation, the back is now drilled with uppers only, 18- to 20-ft. holes being drilled at 40

deg. 5 to 6 ft. apart in rows 4 ft. apart running across the stope. The 40-deg. angle is set with a protractor. The modification of method has several advantages.

Diamond-impregnated-matrix type bits are used, of EXT size to accommodate 1 1/8-in. powder. In December 1946, 94% of the output was produced by core-drilling the blast holes. The yearly average rate of bit penetration in 1946 was 0.3170 in. per minute (over-all time) in jasper, 0.9432 in. per minute in ore; and 1.7452 in. per minute in rock. The average for all three was 0.9211 in. per minute.

Cost per foot of blast hole was $1.4319 per foot drilled in 1946 and $1.1809 in 1941, the difference being attributed to a 56% increase in wages and a 71% increase in bit cost.

Core drilling has proved nearly twice as fast as percussion drilling. Rigging time has been reduced by one third and the cost per foot of hole by 32.7%.

Acid Water Neutralized

Experiences with acid mine water in unwatering a comparatively small area near Baxter Springs, Kan., were related by Mr. Bilharz. The problem was to discharge the mine water into Spring River without causing undue change in the chemical quality of the latter's water. A circuit for the use of CaO in the form of hydrated lime, and an elaborate system of treatment plants and settling basins, were constructed, whereby the aforesaid objective was attained.

At a joint session of the Industrial Minerals and Coal Divisions on borehole drilling, Leon W. Dupuy, of the U. S. Bureau of Mines, talked on "Fundamental Factors in Exploratory Diamond Drilling." He also discussed the selection of equipment, and noted that the Bureau had gone over almost entirely from EX- to AX-size bits in its field drilling. He said that the Bureau is studying the possibility of establishing a standard method of classifying diamonds by quality so that drill operators will not have to judge purchases solely on the basis of dollar value as at present. J. R. Thoenen, of the Bureau of Mines, summarized the findings of a recent paper on "Churn Drill Performance," of which he and E. J. Lintner are coauthors. Data were procured from tests at various quarries in an attempt to evaluate the factors affecting churn-drilling performance. Final conclusions were not reached, but, among several tentative findings, it was indicated that the mechanical efficiency of a churn drill, exclusive of the drill mechanism and power unit, seldom exceeds 20% and averages nearer 10%.

Test work to determine the different physical properties of mine rock was described by Stephen Windes in the paper authored by him and Leon Obert, both members of the U. S. Bureau of Mines staff, and design of safe and economical arch structures was

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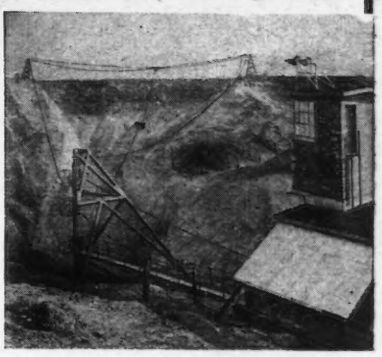

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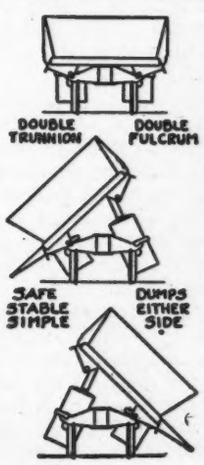

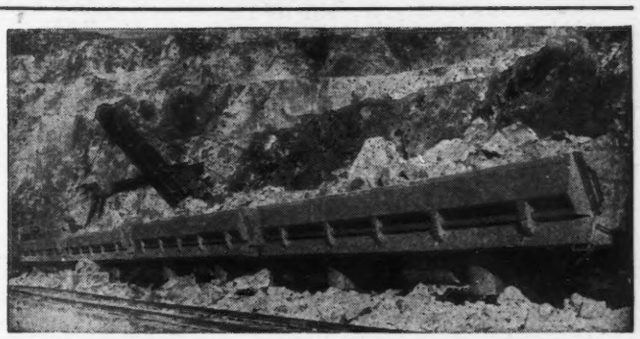

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A SHALE LOADER IS SHOWN DUMPING INTO A TRUCK at the upper adit of the U. S. Bureau of Mines experimental oil shale mine west of Rifle, Colo. E. D. Gardner described the operations at the recent A.I.M.E. meeting. U.S.B.M. photo.

A.I.M.E. Meeting

(*Continued from Page* 157)

discussed by Louis A. Panek. In his paper, "The Shrink Fill Method of Mining Ore," Prof. P. B. Bucky explained a new mining method for greater ore production and safer working conditions. The Government experimental oil-shale operations at Rifle, Colo., were described by E. D. Gardner, U. S. Bureau of Mines.

Industrial Minerals

The Industrial Minerals Division met on Wednesday afternoon, C. H. Behre, Jr., and J. L. Gillson acted as associate chairmen. R. H. Jahns opened the proceedings with his paper "Petrographic Features of Sheet Muscovite in Southeastern United States as Related to Commercial Clarification." He was followed by Eugene N. Cameron, U. S. Geological Survey, who read a paper entitled "Application of the Concept of Zonal Structure for Prospecting for Feldspar." The Indianaite clay deposits of Lawrence County, Ind., were discussed by Eugene Callaghan, and C. Faessler read the paper "Epigenesis of Minerals and Rocks of the Canadian Serpentine Belt," of which M. L. Badolet, of Johns-Manville Corporation, is coauthor. Additional papers read during the session included: "Talc Deposits of the Gouverneur District New York," by A. E. J. Engel, U. S. Geological Survey; "Circle and Sink Deposits of Missouri," by W. B. Mather; "Magnesite Deposits of Gabbs, Nevada," by Charles J. Vitalliano, U. S. Geological Survey, and Eugene Callaghan; and "Pennsylvania Clay Horizons of Western Maryland," by Karl M. Waage. Numerous slides were shown to supplement the papers.

Synthetic Mica Research Aided by Army Grant

A grant of $29,000 has been made to the Colorado School of Mines by the United States Army Signal Corps for "a study of the process of making synthetic mica or some inorganic substitute," Dr. Ben H. Parker, president of the school, announces. Dr. Leon S. Ward, head of the department of chemistry, has been appointed director of the research program. Dr. M. F. Coolbaugh, president emeritus of the school, will collaborate with Dr. Ward in the research.

During World War II sheet mica suitable for use in high-grade condensers in electrical equipment became a top strategic mineral, Dr. Ward pointed out, in discussing the essential nature of the research program. Because of its insulating properties, thinness, and flexibility, the use of substitutes was not found possible. Although the United States has large sources of flake mica useful for such purposes as insulating materials in buildings, the domestic supply of sheet mica is insignificant, and needs were supplied from India.

German research during the war demonstrated the possibility of obtaining sheet mica by the application of a process requiring specially designed furnaces capable of very high temperatures at which the contents of the furnace are in a molten state, keeping this temperature for a long period of time, and gradually cooling the material so that the proper crystalline structure is obtained (*E.&M.J.*, June, 1946, p. 162). This is a costly process, Dr. Ward stated, and much of the research at the Colorado School of Mines will concern not only refinements of this process but also the use of other methods and perhaps different materials, looking toward more efficient and economical processes.

Premier Gold Mining Co. To Be Dissolved

Liquidation and dissolution of Premier Gold Mining Co., Ltd., has been recommended by the board of directors. Stockholders were to vote on the proposal at a special meeting in Vancouver, B. C., on April 1. A letter from R. F. Goodwin, president, informed them that increased labor, material, and equipment costs and a fixed price for the end product had rendered many gold-mining ventures unprofitable. The Premier company, he explained, had actually received less for its gold output last year than in 1945 as a result of the raising of the Canadian dollar to parity with the United States dollar.

Premier Gold Mining Co. is an investment holding rather than an operating enterprise. Holdings include Toburn Gold Mines, Ltd.; Silbak Premier Mines, Ltd.; Saudi Arabian Mining Syndicate, Ltd.; and Big Bell Mines, Ltd. Under the proposed liquidation, shares in these companies, plus cash amounts to be determined, would be distributed on a pro-rata basis to Premier shareholders.

Hochschild Establishes Scholarship Awards

Dr. Mauricio Hochschild, South American mining engineer, mine owner, and business man, has granted three scholarships at the School of Social Sciences and Public Affairs of The American University, Washington, D. C. The students, to be known as Hochschild Fellows, will come from Bolivia, Peru, and Chile and will hold the scholarships for two years. They will be enabled to take post-graduate courses in public administration, economics, and the social sciences. Candidates will be selected by a committee headed by Benjamin Cohen, of Chile, assistant secretary general in charge of public information for the United Nations. It was announced by Lieut.-Gen. Harold L. George, chairman of the board of Peruvian International Airways and a member of the committee, that his company would offer free transportation to the successful candidates.

Dr. Hochschild, who has recently made addresses on the theme of Latin American Union and World Government at The American University and at Colgate University, intends to continue these activities in the interests of international education and cooperation.

The Hochschild interests control about 30% of Bolivia's tin production, all of the zinc production, most of the lead and approximately two-thirds of the silver production.